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# UNIVERSITY OF MARYLAND

OFFICIAL PUBLICATION

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Vol. 29

January, 1932

No. 1

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## THE GRADUATE SCHOOL



ANNOUNCEMENTS

1932-1933

COLLEGE PARK, MARYLAND



# THE UNIVERSITY *of* MARYLAND

## THE GRADUATE SCHOOL ANNOUNCEMENTS FOR THE SESSIONS OF 1932-1933





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# CALENDAR

1932-1933

## *First Semester*

1932

Sept. 20-22	Tuesday-Thursday	Registration.
Sept. 23	Friday, 8.20 a. m.	Instruction for first semester begins.
Oct. 1	Saturday	Last day to file applications for admission to candidacy for the Doctor's degree at Commencement of 1933.
Nov. 24	Thursday	Thanksgiving Day. Holiday.
Dec. 14	Wednesday, 4.20 p. m.	Christmas Recess begins.

1933

Jan. 4	Wednesday, 8.20 a. m.	Christmas Recess ends.
Jan. 28-Feb. 4	Saturday-Saturday	First semester examinations.

## *Second Semester*

Jan. 23-27	Monday-Friday	Registration for second semester.
Feb. 7	Tuesday, 8.20 a. m.	Instruction for second semester begins.
		Last day to file applications for admission to candidacy for the Master's degree at Commencement of 1933.
Feb. 22	Wednesday	Washington's Birthday. Holiday.
Apr. 11-19	Tuesday, 4.10 p. m.- Wednesday, 8.20 a. m.	Easter Recess.
May 23	Tuesday	Last day to deposit Doctor's Theses in the office of Graduate School.
May 30	Tuesday	Memorial Day. Holiday.
May 31	Wednesday	Last day to deposit Master's theses in the office of Graduate School.
June 3-10	Saturday-Saturday	Second semester examinations.
June 11	Sunday, 11 a. m.	Baccalaureate sermon.
June 12	Monday	Class Day.
June 13	Tuesday, 11 a. m.	Commencement.

## *Summer Term*

June 28	Wednesday	Summer School begins.
Aug. 8	Tuesday	Summer School ends



## BOARD OF REGENTS

SAMUEL M. SHOEMAKER, Chairman.....	1924-1933
Eccleston, Baltimore County	
JOHN M. DENNIS, Treasurer.....	1923-1932
Union Trust Co., Baltimore	
WILLIAM P. COLE, JR.....	1931-1940
Towson, Md.	
JOHN E. RAINE.....	1930-1939
1200 St. Paul Street, Baltimore, Md.	
CHARLES C. GELDER.....	1929-1938
Princess Anne, Somerset County	
DR. W. W. SKINNER, Secretary.....	1927-1936
Kensington, Montgomery County	
E. BROOKE LEE (Appointed 1927).....	1926-1935
Silver Spring, Montgomery County	
HENRY HOLZAPFEL, JR.....	1925-1934
Hagerstown, Washington County	
GEO. M. SHRIVER.....	1928-1933
Old Court Road, Baltimore, Md.	

## ADMINISTRATIVE OFFICERS

RAYMOND A. PEARSON, M.S., D.Agr., LL.D., President of the University  
H. C. BYRD, B.S., Assistant to the President.  
FRANK K. HASZARD, Executive Secretary.  
C. O. APPLEMAN, Ph.D., Dean of the Graduate School.  
ELSIE PARRETT, M.A., Secretary to the Dean.  
WILLARD S. SMALL, Ph.D., Director of the Summer School.  
ADELE STAMP, M.A., Dean of Women.  
W. M. HILLEGEIST, Registrar.  
ALMA H. PREINKERT, M.A., Assistant Registrar.  
MAUDE F. MCKENNEY, Financial Secretary.  
GRACE BARNES, B.S., B.L.S., Librarian.  
H. L. CRISP, M.M.E., Superintendent of Buildings.  
T. A. HUTTON, B.A., Purchasing Agent and Manager of Students' Supply Store.

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## THE GRADUATE SCHOOL COUNCIL

RAYMOND A. PEARSON, M.S., D.Agr., LL.D., President of the University.  
C. O. APPLEMAN, Ph.D., Dean of the Graduate School, Chairman.  
A. N. JOHNSON, D.Eng., Professor of Highway Engineering.  
M. MARIE MOUNT, M.A., Professor of Home and Institutional Management.  
H. J. PATTERSON, D.Sc., Director of the Agricultural Experiment Station.  
W. S. SMALL, Ph.D., Professor of Education.  
T. H. TALIAFERRO, C.E., Ph.D., Professor of Mathematics.  
E. C. AUCHTER, Ph.D., Professor of Horticulture.  
L. B. BROUGHTON, Ph.D., Professor of Chemistry.  
E. N. CORY, Ph.D., Professor of Entomology.  
H. F. COTTERMAN, Ph.D., Professor of Agricultural Education.  
H. C. HOUSE, Ph.D., Professor of English and English Literature.  
DEVUE MEADE, Ph.D., Professor of Animal and Dairy Husbandry.  
G. L. JENKINS, Ph.D., Professor of Pharmaceutical Chemistry (Baltimore).  
EDUARD UHLENHUTH, Ph.D., Professor of Gross Anatomy (Baltimore).

# GENERAL INFORMATION

## HISTORY AND ORGANIZATION

In the earlier years of the institution the Master's degree was frequently conferred, but the work of the graduate students was in charge of the departments concerned, under the supervision of the General Faculty. The Graduate School of the University of Maryland was established in 1918 and organized graduate instruction leading to both the Master's and the Doctor's degree was undertaken. The faculty of the Graduate School includes all members of the various faculties who give instruction in approved graduate courses. The general administrative functions of the Graduate Faculty are delegated to a Graduate Council, of which the Dean of the Graduate School is chairman.

## LOCATION

The University of Maryland is located at College Park, in Prince George's County, Maryland, on the Baltimore and Ohio Railroad, eight miles from Washington and thirty-two miles from Baltimore. Washington, with its wealth of resources, is easily accessible by train, street car and bus.

The Professional Schools of Medicine, Nursing, Pharmacy, Dentistry and Law are located in Baltimore, at the corner of Lombard and Greene Streets.

## LIBRARIES

In addition to the resources of the University library, the great libraries of the National Capital are easily available for reference work. Because of the close proximity of these libraries to College Park they are a very valuable asset to research and graduate work at the University of Maryland.

The new library building at College Park contains a number of seminar rooms and other desirable facilities for graduate work.

## THE GRADUATE CLUB

The graduate students maintain an active Graduate Club. Several meetings for professional and social purposes are held during the year. Students working in different departments have an opportunity to become acquainted with one another and thus profit by the broad cultural values derived from contacts with fellow students working in different fields.

## GENERAL REGULATIONS

### ADMISSION

Graduates of colleges and universities of good standing are admitted to the Graduate School. Before entering upon graduate work all applicants must present evidence that they are qualified by their previous work to pursue with profit the graduate courses desired. Application blanks for admission to the Graduate School are obtained from the office of the Dean. After approval of the application, a matriculation card, signed by the Dean, is issued to the student. This card permits the student to register in the Graduate School. After payment of the fee, the matriculation card is stamped and returned to the student. It is the student's certificate of membership in the Graduate School, and may be called for at any succeeding registration.

*Admission to the Graduate School does not necessarily imply admission to candidacy for an advanced degree.*

### REGISTRATION

All students pursuing graduate work in the University, even though they are not candidates for higher degrees, are required to register at the beginning of each semester in the office of the Dean of the Graduate School, Room T-214, Agricultural Building. Students taking graduate work in the Summer School are also required to register in the Graduate School at the beginning of each session. In no case will graduate credit be given unless the student matriculates and registers in the Graduate School. The program of work for the semester or the summer session is entered upon two course cards, which are signed first by the professor in charge of the student's major subject and then by the Dean of the Graduate School. One card is retained in the Dean's office. The student takes the other card, and, in case of a new student, also the matriculation card, to the Registrar's office, where a charge slip for the fee is issued. The charge slip, together with the course card, is presented at the Cashier's office for adjustment of fees. After certification by the Cashier that fees have been paid, class cards are issued by the Registrar. Students will not be admitted to graduate courses without class cards. Course cards may be obtained at the Registrar's office or at the Dean's office. The heads of departments usually keep a supply of these cards in their respective offices.

### GRADUATE COURSES

Graduate students must elect for credit in partial fulfillment of the requirements for higher degrees only those courses designated *For Graduates* or *For Graduates and Advanced Undergraduates*. Graduate students may elect courses numbered from 1 to 99 in the general catalogue but graduate credit will not be allowed for these courses. Students with inadequate preparation may be obliged to take some of these courses as prerequisites for advanced courses.

## PROGRAM OF WORK

The professor who is selected to direct a student's thesis work is the student's adviser in the formulation of a graduate program including suitable minor work. This program receives the approval of the Dean by his endorsement of the student's course card.

To encourage thoroughness in scholarship through intensive application, graduate students in the regular sessions taking courses carrying full graduate credit are limited to a program of thirty credit hours for the year. Students holding half-time graduate assistantships are usually limited to sixteen credit hours for the year. Four or six additional credits may be allowed if six or more of the total constitute seminar and research work.

Residence credit for all research work relating directly to the Master's or the Doctor's thesis should be stated as credit hours on the registration card for the semester in which the work is to be done. If a student is doing only research work under the direction of an official of the institution he must register and pay for a minimum of four credit hours per semester. The number of credit hours reported at the end of the semester will depend upon the work accomplished, but it will not exceed the number for which the student is registered.

## SUMMER GRADUATE WORK

Graduate work in the Summer Session may be counted as residence toward an advanced degree. Four summer sessions and six credits on thesis work done *in absentia* under direction may be accepted as satisfying the residence requirement for the Master's degree. By carrying approximately six semester hours of graduate work for four sessions and upon submitting a satisfactory thesis, a student may be granted the degree of Master of Arts or Master of Science. In some instances a fifth summer may be required in order that a satisfactory thesis may be completed.

Graduate students who combine the summer and winter plans for the Master's degree are required to spend at least three full summers and one semester in residence.

Students may transfer no more than six semester hours from another institution; such transfer does not shorten the required residence period.

Graduate work may be pursued during the entire summer in some departments, by special arrangement. Such students as graduate assistants, or others who may wish to supplement work done during the regular year, may satisfy one-third of an academic year's residence by full-time graduate work for 11 or 12 weeks, provided satisfactory supervision and facilities for summer work are available in their special fields.

The University publishes a special bulletin giving full information concerning the Summer School and the graduate courses offered during the Summer Session. This bulletin is available upon application to the Registrar of the University.



## **GRADUATE WORK IN PROFESSIONAL SCHOOLS AT BALTIMORE**

Graduate courses and opportunities for research work are offered in some of the professional schools at Baltimore. Students pursuing graduate work in the professional schools must register in the Graduate School, meet the same requirements, and proceed in the same way as do graduate students in other departments of the University.

The graduate courses in the professional schools are listed on pages 53-58.

## **GRADUATE WORK BY SENIORS IN THIS UNIVERSITY**

Seniors who have completed all their undergraduate courses in this University by the end of the first semester and who continue their residence in the University for the remainder of the year, are permitted to register in the Graduate School and secure the privileges of its membership, even though the bachelor's degree is not conferred until the close of the year.

Seniors of this University who have nearly completed the requirements for the undergraduate degree may, with the approval of their undergraduate Dean and the Dean of the Graduate School, register in the undergraduate college for graduate courses, which will be transferred for graduate credit toward a higher degree at this University, but the total of undergraduate and graduate courses must not exceed 15 credits for the semester.

## **ADMISSION TO CANDIDACY FOR ADVANCED DEGREES**

Application for admission to candidacy for either the Master's or the Doctor's degree is made on application blanks which are obtained at the office of the Dean of the Graduate School. These are filled out in duplicate and after the required endorsements are obtained, the applications are acted upon by the Graduate Council. An official transcript of the candidate's undergraduate record and any graduate courses completed at other institutions must accompany the application unless these are already on file in the Dean's office.

A student making application for admission to candidacy for the degree of Doctor of Philosophy must also obtain from the head of the Modern Language Department a statement that he possesses a reading knowledge of French and German.

Admission to candidacy in no case assures the student of a degree, but merely signifies that the candidate has met all the formal requirements and is considered by his instructors sufficiently prepared and able to pursue such graduate study and research as are demanded by the requirements of the degree sought. The candidate must show superior scholarship by the type of graduate work already completed. Preliminary examinations or such other substantial tests as the departments may elect are also required for admission to candidacy for the degree of Doctor of Philosophy.

Application for admission to candidacy is made at the time stated in the sections dealing with the requirements for the degree sought.

## REQUIREMENTS FOR THE DEGREES OF MASTER OF ARTS AND MASTER OF SCIENCE

**Advancement to Candidacy.** Each candidate for the Master's degree is required to make application for admission to candidacy not later than the date when instruction begins for the second semester of the academic year in which the degree is sought, but not until at least the equivalent of one semester of graduate work has been completed.

**Residence Requirements.** The standard residence requirement is one academic year, but this does not mean that the work prescribed for each individual student can always be completed in one academic year. Inadequate preparation for the graduate courses the student wishes to pursue may make a longer period necessary.

**Credits and Scholarship Requirements.** The minimum credit requirement is 30 semester hours in courses approved for graduate credit. From 18 to 20 credits must be earned in the major subject; and at least one-half of the total major credits, including thesis, must be taken in courses for graduates only. The number of major credits allowed for thesis ranges from 6 to 10, depending upon the amount of work done and upon the major course requirements. From 10 to 12 credits must lie outside the major subject and form a coherent group of courses intended to supplement and support the major work. The maximum total credit for the one hour per week seminar courses is limited to four semester hours in the major subject and to two semester hours in the minor subjects. No credits are acceptable for an advanced degree that are reported with a grade lower than "C".

At least 20 of the 30 semester credits required for the Master's degree must be taken at this institution. In certain cases graduate work done in other graduate schools of sufficiently high standing may be substituted for the remaining required credits, but any such transfer of credits does not shorten the normal required residence at the University of Maryland. The Graduate Council, upon recommendation of the head of the major department, passes upon all graduate work done at other institutions. The final examination will cover all graduate work offered in fulfillment of the requirements for the degree.

Work in accredited research laboratories of the United States Department of Agriculture and other local national research agencies may be accepted, when previously arranged, as residence work in fulfillment of the thesis requirement for a degree. These laboratories are located within easy reach of the University.

**Thesis.** The thesis required for the Master's degree should be typewritten, double spaced, on a good quality of paper 11 x 8½ inches in size. The original copy must be deposited in the office of the Graduate School not later than two weeks before commencement.

It should be held together with removable clamp, and placed in a manila or other durable folder, with the title, and name of writer, on the outside.

The thesis should not be stapled together, as it is later bound by the University and placed in the Library. One or two additional copies should be provided for use of members of the examining committee prior to the final examination. If the thesis contains extensive charts or graphs, it is not necessary to duplicate them in the carbon copies, as the official copy will be accessible to professors.

**Final Examination.** The final oral examination is conducted by a committee appointed by the Dean of the Graduate School. The student's adviser acts as the chairman of the committee. The other members of the committee are persons under whom the student has taken most of his major and minor courses. The chairman and the candidate are notified of the personnel of the examining committee at least one week prior to the period set for the examination. The chairman of the committee selects the exact time and place for the examination and notifies the other members of the committee and the candidate. The examination should be conducted within the dates specified and a report of the examination sent to the Dean as soon as possible after the examination. A special form for this purpose is supplied to the chairman of the committee. Such a report is the basis upon which recommendation is made to the faculty that the candidate be granted the degree sought.

The final examination is oral, but a previous written examination in courses of the semester immediately preceding the examination may be required at the option of the individual members of the committee. The period for the oral examination is approximately one hour.

The examining committee also approves the thesis, and it is the candidate's obligation to see that each member of the committee has ample opportunity to examine a copy of the thesis prior to the date of the examination.

A student will not be admitted to final examination until all other requirements for the degree have been met.

## REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

**Advancement to Candidacy.** Candidates for the Doctor's degree must be admitted to candidacy not later than one academic year prior to the granting of the degree. Applications for admission to candidacy for the Doctor's degree must be deposited in the office of the Dean not later than October 1 of the academic year in which the degree is sought.

**Residence.** Three years of full-time resident graduate study beyond the Bachelor's degree or two years beyond the Master's degree are required. The first two of the three years may be spent in other institutions offering standard graduate work. On a part-time basis the time needed will be correspondingly increased. The degree is not given merely as a certificate of residence and work, but is granted only upon sufficient evidence of high attainments in scholarship and ability to carry on independent research in the special field in which the major work is done.



**Major and Minor Subjects.** The candidate must select a major and one or two closely related minor subjects. Thirty semester hours of minor work are required. The remainder of the required residence is devoted to intensive study and research in the major field. The amount of required course work in the major subject will vary with the department and the individual candidate.

**Thesis.** The ability to do independent research must be shown by a dissertation on some topic connected with the major subject. The original typewritten copy of the thesis must be deposited in the office of the Dean at least three weeks before the time the degree is granted. One or two extra copies should be provided for use of members of the examining committee prior to the date of the final examination. The theses are later printed in such form as the committee and the Dean may approve and fifty copies are deposited in the library.

**Final Examination.** The final oral examination is held before a committee appointed by the Dean. One member of this committee is a representative of the Graduate Faculty who is not directly concerned with the student's graduate work. One or more members of the committee may be persons from other institutions, who are distinguished scholars in the student's major field.

The duration of the examination is approximately three hours and should cover the research work of the candidate as embodied in his thesis, and his attainments in the fields of his major and minor subjects. The other detailed procedures are the same as those stated for the Master's examination.

## RULES GOVERNING LANGUAGE EXAMINATIONS FOR DOCTOR OF PHILOSOPHY CANDIDATES

1. Candidates for the Doctor's degree are expected to possess a reading knowledge of French and German. In the examination they will be expected to read at sight from books or articles in their specialized fields. It is not expected that the candidate know every single word of the text. The examiners will supply occasional foreign terms, but it is presumed that the student knows sufficient grammar to recognize inflectional forms.

2. The student is asked to bring books or periodicals to the examination to the amount of about 400 to 500 pages, from which the examiners will select a number of paragraphs for the reading test.

3. No penalty is attached to failure in the examination and the unsuccessful candidate is free to try again at the next date set for these tests.

4. Graduate students expecting to take the examination are asked to register their names in the Graduate School Office at least three days prior to the test. *Examinations are held in the office of the Modern Language Department on the first Wednesdays in February, June, and October at 2 p. m.*

## GRADUATE FEES

The fees paid by graduate students are as follows:

A matriculation fee of \$10.00. This is paid once only, upon admission to the Graduate School.

A fixed charge, each semester, at the rate of \$1.50 per semester credit hour, with a minimum charge of \$6.00.

A diploma fee (Master's degree), \$10.00.

Graduation fee, including hood (Doctor's degree), \$20.00.

## FELLOWSHIPS AND GRADUATE ASSISTANTSHIPS

A number of fellowships and graduate assistantships have been established by the University. A few industrial fellowships are also available in certain departments.

**Applications for Fellowships and Graduate Assistantships.** Application blanks may be obtained at the office of the Dean of the Graduate School. The application with the necessary credentials is sent by the applicant direct to the Dean not later than May 15. The Dean's endorsement assures the applicant of admission to the Graduate School in case he is awarded either a fellowship or a graduate assistantship. After the applications have been approved by the Dean they are sent to the heads of the departments concerned, who make the selection and recommend to the proper administrative officer that the successful applicants be appointed. All the applications, together with the credentials, are then returned to the office of the Graduate School. Those of the successful applicants, properly endorsed, are placed on file for record. The credentials will be returned to the unsuccessful applicants.

**Stipend.** The University fellowships pay \$500 and the appointment is for the academic year. In certain cases the term of appointment may be extended to include one or two summer months in addition to the nine months of the academic year.

The stipend for the industrial fellowships varies according to the type of fellowship.

The stipend attached to the graduate assistantships is \$1,000 per annum and the appointments are made for twelve months, with one month's vacation. Graduate students holding appointments as fellows or graduate assistants are exempt from all fees except graduation fees.

**Service Requirements.** Each University fellow is expected to give a limited portion of his time to instruction or equivalent duties prescribed by the major department. The usual maximum amount of service required is five hours per week of class-room work or twelve hours of laboratory and other prescribed duties. No service is required of the industrial fellow other than research. The teaching graduate assistants devote one-half of their time to instruction. This is equivalent to about one-half of the load

of a full-time instructor. Several research assistantships are offered by the Experiment Station and the only service required is in connection with research projects.

**Residence Requirements for a Degree.** Fellows may satisfy the residence requirements for either the Master's or Doctor's degree without extension of the usual time.

Graduate assistants are required to spend two years in residence for the Master's degree, but for the Doctor's degree they are allowed two-thirds residence credit for each academic year at this University. The minimum residence requirement from the Bachelor's degree, therefore, may be satisfied in four academic years and one summer, or three academic years and three summers of 11 to 12 weeks.

## COMMENCEMENT

Attendance is required at the commencement at which the degree is conferred, unless the candidate is excused by the Dean and the President of the University.

## DESCRIPTION OF COURSES

For the convenience of students in making out schedules of studies, the subjects in the following Description of Courses are arranged alphabetically:

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Genetics and Statistics.....	43
German.....	49
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Horticulture.....	44
Mathematics.....	47
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Pharmacology.....	54 and 57
Pharmacy.....	58
Physics.....	50
Physiology.....	53
Psychology.....	51
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For convenience in identification, Courses for Graduates and Advanced Undergraduates are numbered 100 to 199; Courses for Graduates are numbered 200 and upward.

The letter following the number of the course indicates the semester in which the course is offered: Thus, 100f is offered the first semester; 101s, the second semester; 102y, the year. Capital S after a course number indicates that the course is offered in the summer session only.

The number of hours' credit is shown by the arabic numeral in parenthesis after the title of the course.

A separate schedule of courses is issued each semester, giving the hours, places of meeting, and other information required by the student in making out his schedule. Students will obtain these schedules when they register.

When enrolling, students should indicate on blue card the symbol, number, and name of course, together with number of credits to be earned.

## AGRICULTURAL ECONOMICS

### Courses for Graduates and Advanced Undergraduates

A. E. 101 s. *Transportation of Farm Products* (3)—Three lectures.

A study of the development of transportation in the United States, the different agencies for transporting farm products, with special attention to such problems as tariffs, rate structure, and the development of fast freight lines, refrigerator service, truck transportation of agricultural products, etc. (Russell.)

A. E. 102 s. *Marketing of Farm Products* (3)—Three lectures. Prerequisite, Econ. 3 s.

A complete analysis of the present system of transporting, storing, and distributing farm products and a basis for intelligent direction of effort in increasing the efficiency of marketing methods. (DeVault.)

A. E. 103 f. *Co-operation in Agriculture* (3)—Three lectures. Prerequisite, Econ. 3 s.

Historical and comparative development of farmers' co-operative organizations with some reference to farmer movements; reasons for failure and essentials to success; commodity developments; the Federal Farm Board; trend of present tendencies. (Russell.)

A. E. 104 s. *Agricultural Finance* (3)—Three lectures. *Agricultural Credit* requirements; institutions financing agriculture; financing specific farm organizations and industries. *Taxation* of various farm properties; burden of taxation on different industries; methods of taxation; proposals for tax reform. *Farm Insurance*—fire, crop, livestock, and life insurance with especial reference to mutual developments—how provided, benefits, and needed extension. (Russell.)

A. E. 105 s. *Food Products Inspection* (3)—Two lectures and one laboratory.

This course, arranged by the Department of Agricultural Economics in co-operation with the State Department of Markets and the United States Department of Agriculture, is designed to give students primary instruction in the grading, standardizing and inspection of fruits and vegetables, dairy products, poultry products, and meats. Theoretical instruction covering the fundamental principles will be given in the form of lectures, while the demonstrational and practical work will be conducted through laboratories and field trips to Washington, D. C., and Baltimore. (Staff.)

A. E. 106 f. *Prices* (2)—One lecture; one laboratory.

A general course in prices and price relationships with emphasis on prices of agricultural products. (Russell.)

A. E. 109 y. *Research Problems* (1-3).



With the permission of the instructor, students will work on any research problems in Agricultural Economics which they may choose, or a special list of subjects will be made up from which the students may select their research problems. There will be occasional class meetings for the purpose of making reports on progress of work, methods of approach, etc. (DeVault.)

### Courses for Graduates

A. E. 201 y. *Special Problems in Agricultural Economics* (3).

An advanced course dealing more extensively with some of the economic problems affecting the farmer, such as land problems, agricultural finance, farm wealth, agricultural prices, transportation, and special problems in marketing and co-operation. (DeVault.)

A. E. 202 y. *Seminar* (1-3).

This course will consist of special reports by students on current economic subjects, and a discussion and criticism of the same by the members of the class and the instructor. (DeVault.)

A. E. 203 y. *Research and Thesis* (8)—Students will be assigned research work in Agricultural Economics under the supervision of the instructor. The work will consist of original investigation in problems of Agricultural Economics, and the results will be presented in the form of a thesis. (DeVault.)

A. E. 205 f. *Advanced Agricultural Geography and Commerce* (2)—One double period a week.

Individual advanced study of agricultural geography from a commodity standpoint. (Not given in 1932-1933.) (Russell.)

A. E. 210 f. or s. *Taxation in Relation to Agriculture* (3)—One lecture; two laboratory or practicum periods per week.

Principles and practices of taxation in their relation to agriculture, with special reference to the trends of expenditures and tax levies; taxation in relation to land utilization; taxation in relation to ability to pay and benefits received; methods of assessing property; the general property tax as a major source of revenue; the Federal and State income tax; the gasoline and motor vehicle license tax; the sales tax; the inheritance and gift tax; other sources of revenue; and possibilities of economy in the expenditure of tax revenues. (DeVault and Walker.)

## AGRICULTURAL EDUCATION AND RURAL LIFE

### Courses for Graduates and Advanced Undergraduates

AG. ED. 101 s. *Observation and the Analysis of Teaching for Agricultural Students* (3)—Two lectures; one laboratory. Open to juniors and seniors; required of juniors in Agricultural Education. Prerequisite, Ed. 101. Cannot be counted toward major for advanced degree in Agricultural Education.

This course deals with an analysis of pupil learning in class groups. It includes a study of pupil and teacher objectives; objectives in secondary education; objectives in vocational education; objectives in vocational agri-

cultural education; individual differences; varying elements in class and classroom situations; lesson patterns; pupil activities and procedures in the class period; measuring results; steps in teaching procedure; types of lessons; classroom management; observation and critiques. (Cotterman and Worthington.)

Ag. Ed. 102 f. *Course Construction and Project Estimating* (2)—One lecture; one laboratory. Prerequisite, Ag. Ed. 101. Cannot be counted toward major for advanced degree in Agricultural Education.

Factors in the selection of course content; the selection of farm enterprises; the analysis of enterprises and farm jobs for instructional purposes; preparation of teachers' course outlines; the development of directed and supervised practice programs; project forecasting and estimating; systems of project cost accounting; practice in project accounting; the selection of content and lesson plans in terms of cost factors; practice in cost factor analysis; project cost factors as a motivation in day to day classroom instruction. (Cotterman and Worthington.)

Ag. Ed. 103 f. *Teaching Secondary Vocational Agriculture* (3)—Three lectures. Prerequisites, Ag. Ed. 101, 102; A. H. 1, 2; D. H. 1; Poultry 101; Soils 1; Agron. 1, 2; Hort. 1, 11; F. Mech. 101, 104; A. E. 2, 102; F. M. 2. Cannot be counted toward major for advanced degree in Agricultural Education.

Objectives in vocational agricultural education; historical development; place of day class instruction in the high school program of studies; placement programs and the relation of placement to classroom instruction; directed and supervised practice programs; project selection; project study and job analysis; methods of class period, lesson planning; objectives, course content, and methods in evening and part-time classes; equipment; co-curricular activities; advisory committees and departmental goals; co-operative relationships; administrative programs; measuring results; publicity; records and reports. (Cotterman.)

Ag. Ed. 104 s. *Departmental Organization and Administration* (2)—One lecture; one laboratory. Prerequisites, Ag. Ed. 101, 102, 103.

The work of this course is based upon the construction and analysis of administrative programs for high school departments of vocational agriculture. As a project each student prepares and analyzes in detail an administrative program for a specific school. Investigations and reports. (Cotterman and Staff.)

Ag. Ed. 105 f. or s. *Practice Teaching* (2)—Prerequisites, Ag. Ed. 101, 102, 103. Cannot be used for credit toward an advanced degree in Agricultural Education.

Under the immediate direction of a critic teacher the student in this course is required to analyze and prepare special units of subject matter, plan lessons, and teach in cooperation with the critic teacher exclusive of observation not less than twenty periods of vocational agriculture. (Worthington and Cotterman.)

Ag. Ed. 106 s. *Rural Life and Education* (3)—Three lectures.

Normal life in rural communities; changing rural communities; ancient and foreign rural communities; evolution of American rural communities;

the home, school, and church as rural institutions; rural community consciousness; the Grange and other volunteer governmental organizations; juvenile clubs and social life; problems in rural government and political education; contest and fairs as means of reaching educational objectives; extension service programs; work of consolidated high schools, experiment stations and state universities; commercial concerns as educational agencies; economic and social differences in rural areas; rural cooperation; the message of Denmark; social "rings"; tendencies and opportunities in high grade rural living; investigations and reports. This course is designed especially for persons who expect to be called upon to assist in shaping educational and other community programs for rural people. (Cotterman.)

AG. ED. 107 s. *Teaching Farm Shop in Secondary Schools* (1)—One lecture.

Objectives in the teaching of farm shop; contemporary developments; determination of projects; shop management; shop programs; methods of teaching; equipment; materials of instruction; special projects. (Carpenter.)

AG. ED. 108 y. *Farm Practicums and Demonstrations* (2)—One laboratory. Cannot be used for credit toward an advanced degree in Agricultural Education.

This course is designed to assist the student in relating the learning acquired in the College of Agriculture with the problems of doing and demonstrating which he faces in the field and classroom as a teacher. It deals with the essential practicums and demonstrations in vocational agriculture in the secondary school. It treats of objectives, organization, equipment and equipment construction. Laboratory practice in deficiencies required. Special assignments and reports. The course aims particularly to check the agricultural student's training in skills and to introduce him to the conditions under which such training must be given in the patronage areas and laboratories of vocational departments. (Seabold.)

AG. ED. 109 s. *Objectives and Methods in Extension Education* (2-3)—Two lectures.

Given under the supervision of the Extension Service, and designed to equip young men to enter the broad field of extension work. Methods of assembling and disseminating the agricultural information available for the practical farmer; administration, organization, supervision, and practical details connected with the work of a county agent, with club work and the duties of an extension specialist. Student will be required to gain experience under the guidance of men experienced in the respective fields. Traveling expenses for this course will be adjusted according to circumstances, the ability of the man, and the service rendered. (Cotterman and Extension Specialists.)

ED. 105 f. *Educational Sociology* (3)—(See Education).

#### Courses for Graduates

AG. ED. 201 f. *Comparative Agricultural Education* (3)—Prerequisite, Ag. Ed. 101.



State systems of instruction in agriculture are examined and evaluated from the standpoint of objectives, the work of teachers and results accomplished; special papers, investigations, and reports. (Cotterman.)

AG. ED. 202 s. *Supervision of Vocational Agriculture* (3)—Prerequisite, Ag. Ed. 101.

Analysis of the work of the supervisor; comparative studies of supervisory programs, policies, and problems; principles of supervision; investigations and reports. (Cotterman.)

AG. ED. 203 S. *School and Rural Community Studies* (2)—(Summer Session only.)

The function of school and rural community studies; typical studies, their purposes and findings; types of surveys; sources of information; planning and preparation of studies; collection, tabulation and interpretation of data. Essentially a course for those majoring and preparing theses in Agricultural Education.

AG. ED. 204 s. *Seminar in Agricultural Education* (3).

Problems in the administration and organization of Agricultural Education—prevocational, secondary, collegiate, and extension: individual problems and papers; current literature. (Cotterman.)

AG. ED. 205 y. *Research and Thesis* (6-8).

Students are assigned research work in Agricultural Education under the supervision of the instructor. Work consists of investigation in Agricultural Education. The results are presented in the form of a thesis. (Cotterman.)

\*ED. 202 f. *College Teaching* (3).

\*ED. 203 s. *Problems in Higher Education* (3).

\*(See Education.)

## AGRONOMY

### Division of Crops

#### Courses for Graduates and Advanced Undergraduates

AGRON. 103 f. *Crop Breeding\** (2)—One lecture; one laboratory. Prerequisite, Gen. 101.

The principles of breeding as applied to field crops and methods used in crop improvement. (Kemp.)

AGRON. 120 s. *Cropping Systems and Methods\** (2)—Two lectures. Prerequisites, Agron. 1 and Soils 1.

Principles and factors influencing cropping systems in the United States; study of rotation experiments; theories of cropping methods; and practice in arranging type farming systems. (Metzger.)

AGRON. 121 s. *Methods of Crop and Soil Investigations\** (2)—One lecture; one laboratory.

A consideration of crop investigation methods at the various experiment stations, and the standardization of such methods. (Metzger.)

\* Cannot be counted as major toward an advanced degree.

## Courses for Graduates

AGRON. 201 y. *Crop Breeding* (4-10)—Credits determined by work accomplished.

The content of this course is similar to that of Agron. 103, but will be adapted more to graduate students, and more of a range will be allowed in choice of material to suit special cases. (Kemp.)

AGRON. 203 y. *Seminar* (2)—One report period each week.

The seminar is devoted largely to reports by students on current scientific publications dealing with problems in crops and soils.

AGRON. 209 y. *Research* (6-8)—Credits determined by work accomplished.

With the approval of the head of the department the student will be allowed to work on any problem in agronomy, or he will be given a list of suggested problems from which he may make a selection. (Staff.)

## Division of Soils

### Courses for Graduates

SOILS 201 y. *Special Problems and Research* (10-12).

Original investigation of problems in soils and fertilizers. (Staff.)

SOILS 202 y. *Soil Technology* (7-5 f, 2 s)—Two lectures, two laboratories, first semester; two lectures, one laboratory, second semester. Prerequisites, Geology 1, Soils 1, and Chemistry 1.

In the first semester chemical and physico-chemical study of soil problems as encountered in field, greenhouse, and laboratory. In the second semester physical and plant nutritional problems related to the soil. (Thomas.)

SOILS 204 s. *Soil Microbiology* (3)—Two lectures; one laboratory. Prerequisite, Bact. 1.

A study of the microorganisms of the soil in relation to fertility. It includes the study of the bacteria of the soil concerned in the decomposition of organic matter, nitrogen fixation, nitrification, and sulphur oxidation and reduction, and deals also with such organisms as fungi, algæ, and protozoa.

This course includes a critical study of the methods used by Experiment Stations in soil investigational work. (Thom.)

## ANIMAL HUSBANDRY

### Courses for Graduates and Advanced Undergraduates

A. H. 101 s. *Nutrition* (3)—Two lectures; one laboratory.

A study of digestion, assimilation, metabolism, and protein and energy requirements. Methods of investigation and studies in the utilization of feed and nutrients. (Meade.)

### Courses for Graduates

A. H. 201 y. *Special Problems in Animal Husbandry* (4-6)—Problems which relate specifically to the character of work the student is pursuing

will be assigned. Credit given will be in proportion to the amount and character of work completed. (Meade.)

A. H. 202 y. *Seminar* (2)—One lecture. Students are required to prepare papers based upon current scientific publications relating to animal husbandry or upon their research work, for presentation before and discussion by the class. (Staff.)

A. H. 203 y. *Research*—Credit to be determined by the amount and character of work done. With the approval of the head of the department, students will be required to pursue original research in some phase of animal husbandry, carry the same to completion, and report the results in the form of a thesis. (Meade, Hunt.)

## BACTERIOLOGY AND PATHOLOGY

### Courses for Graduates and Advanced Undergraduates

BACT. 101 f. *Dairy Bacteriology* (3)—One lecture; two laboratories. Prerequisite, Bact. 1.

Bacteria in milk, sources and development; milk fermentation; sanitary production; care and sterilization of equipment; care and preservation of milk and cream; pasteurization. Public health requirements. Standards Methods of Milk Analysis; practice in the bacteriological control of milk supplies; occasional inspection trips. (Black.)

BACT. 102 s. *Dairy Bacteriology* (Continued) (3)—One lecture; two laboratories. Prerequisite, Bact. 101 f, or consent of instructor in charge.

Relation of bacteria, yeasts and molds to ice cream, butter, cheese, and other dairy products; sources of contamination. Bacteriological analyses and control; occasional inspection trips. (Black.)

BACT. 103 f. *Hematology* (2)—Two laboratories. Bact. 1, desirable.

Procuring blood; estimating the amount of hemoglobin; color index; examination of red cells and leucocytes in fresh and stained preparations; numerical count of erythrocytes and leucocytes; differential count of leucocytes; sources and development of the formed elements of blood; pathological forms and counts. (Reed.)

BACT. 104 f. *Serology* (4)—Two lectures; two laboratories. Junior year. Prerequisite, Bact. 2 s, or consent of instructor in charge.

The theory of agglutinin, precipitin, lysin and complement fixation reactions and their application in the identification of bacteria and diagnosis of disease; factors affecting reactions; principles of immunity and hypersensitiveness; preparation of necessary reagents; general immunologic technique. (Black.)

BACT. 106 f. *Comparative Anatomy and Physiology* (3)—Three lectures.

Structure of the animal body; abnormal as contrasted with normal. The inter-relationship between the various organs and parts as to structure and function. (Reed.)

BACT. 107 s. *Urinalysis* (2)—Two laboratories. Bact. 1, desirable.

Physiologic, pathologic and diagnostic significance; use of clinical methods and interpretation of results. (Reed.)

BACT. 109 f. *Pathological Technique* (3)—One lecture; two laboratories. Bact. 1, desirable.

Examination of fresh material; fixation; isolation; decalcification. Sectioning by free hand and freezing methods; celloidin and paraffin imbedding and sectioning. General staining methods. (Reed.)

BACT. 110 s. *Pathological Technique* (Continued) (3)—One lecture; two laboratories. Prerequisite, Bact. 109 f, or consent of instructor in charge.

Special methods. (Reed.)

BACT. 112 s. *Sanitary Bacteriology* (3)—One lecture; two laboratories. Prerequisite, Bact. 1.

Bacteriological and public health aspects of water supplies, water purification methods, swimming pool sanitation; sewage disposal, industrial wastes; disposal of garbage and other municipal refuse. Practice in standard methods for examination of water and sewage. Differentiation and significance of the coli-aerogenes group; interpretation of bacteriological analyses. (Black.)

BACT. 120 s. *Animal Hygiene* (3)—Three lectures or demonstrations.

Care and management of domestic animals, with special reference to maintenance of health and resistance to disease. Prevention and early recognition of disease; general hygiene; sanitation; first aid. (Reed.)

BACT. 121 f. *Bacteriological Problems* (3-5)—Laboratory. Prerequisite, Bact. 1.

Subject matter suitable to the needs of the particular student, or problems as an introduction to research, will be arranged. The research is intended to develop the student's initiative. The problems are to be selected, outlined, and investigated in consultation with and under the supervision of a faculty member. Methods of research, library practice, and knowledge of current literature are essential parts of the course. (Black and Pickens.)

BACT. 122 s. *Bacteriological Problems* (Continued) (3-5)—Laboratory. Prerequisite, Bact. 1. (Black and Pickens.)

BACT. 123 f. *Thesis* (4)—Laboratory. Prerequisites, Bact. 1 and at least one of the advanced courses. May be substituted for Bact. 121 f.

Investigation of given project, results of which are to be presented in the form of a thesis and submitted for credit towards graduation. (Pickens and Black.)

BACT. 124 s. *Thesis* (Continued) (4)—Senior year. Prerequisites, Bact. 1 and at least one of the advanced courses. May be substituted for Bact. 122 s. (Pickens and Black.)

BACT. 125 s. *Public Health* (1)—One lecture. Prerequisite, Bact. 1.

A series of weekly lectures on Public Health and its Administration, by the experts of the Maryland State Board of Health. (Pickens, in charge.)

BACT. 130 f. *Seminar* (1)—Prerequisites, Bact. 1 and at least one of the advanced courses.

Students will submit reports on current scientific literature or on individual problems in bacteriology, which will be discussed and criticized by members of the class and staff. (Pickens and staff.)

BACT. 131 s. *Seminar* (Continued) (1)—Prerequisites, Bact. 1 and at least one of the advanced courses. (Pickens and staff.)

## Courses for Graduates

BACT. 201 f. *Research Bacteriology* (2-10)—Laboratory. Prerequisites, Bact. 1 and any other courses needed for the particular project.

Properly qualified students will be admitted upon approval of the department head and with his approval the student may select the subject for research. The investigation should be outlined in consultation with and pursued under supervision of a faculty member of the department. The results obtained by major students working towards an advanced degree are to be presented in the form of a thesis, a copy of which must be filed with the department. Credit will be determined by the amount and character of the work accomplished. (Pickens and Black.)

BACT. 202 s. *Research Bacteriology* (Continued) (2-10)—Laboratory. Prerequisites, Bact. 1 and any other courses needed for the particular project. (Pickens and Black.)

BACT. 203 f. *Research in Genital Diseases of Farm Animals* (2-6)—Prerequisite, degree in Veterinary Medicine from an approved veterinary college. Laboratory and field work by assignment. (Reed.)

BACT. 204 s. *Research in Genital Diseases of Farm Animals* (Continued) (2-6)—Prerequisite, degree in Veterinary Medicine from an approved veterinary college. (Reed.)

\*BACT. 205 f. *Advanced Food Bacteriology* (3)—Two lectures; one laboratory. Prerequisite, Bact., 10 hours.

Critical review of microorganisms necessary or beneficial to food products. Food spoilage; theories and advanced methods in food preservation. Application of bacteriological control methods to manufacturing operations. (James.)

\*BACT. 206 s. *Physiology of Bacteria* (3)—Two lectures; one laboratory. Prerequisites, Bact., 10 hours and Chem., 108 or equivalent.

Chemical composition of bacteria; life cycles; influence of environmental conditions on growth and metabolism; bacterial enzymes; fermentations; protein decomposition; disinfection; bacterial variation; changes occurring in media. (James.)

BACT. 207 f. *Special Topics* (1)—Prerequisite, Bact., 10 hours.

Presentation and discussion of fundamental problems and special subjects. (Black.)

BACT. 208 s. *Special Topics* (Continued) (1)—Prerequisite, Bact., 10 hours. (Black.)

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\*Ten students are required for each of these courses. A special fee is charged for them.

## BOTANY

### A. General Botany and Morphology

#### Courses for Graduates and Advanced Undergraduates

BOT. 101 f. *Plant Anatomy* (3)—One lecture; two laboratories. Prerequisite, Bot. 1.



The origin and development of the organs and tissue systems in the vascular plants, with special emphasis on the structures of roots, stems and leaves. Reports of current literature are required. (Bamford.)

BOT. 102 f. *Mycology* (4)—Two lectures; two laboratories.

An introductory study of the morphology, life histories, classification, and economics of the fungi. Methods of cultivating fungi and identification of plant pathogens constitute a large part of the laboratory work. (Norton.)

BOT. 103 f. s. *Plant Taxonomy* (3)—One lecture; two laboratories.

Classification of the vegetable kingdom, and the principles underlying it; the use of other sciences and all phases of botany as taxonomic foundations; methods of taxonomic research in field, garden, herbarium and library. Each student to work in a special problem during some of the laboratory time. (Not offered in 1932-33.) (Norton.)

BOT. 105 s. *Economic Plants* (2)—One lecture; one laboratory.

The names, taxonomic position, native and commercial geographic distribution, and use of the leading economic plants of the world are studied. By examination of plant products in markets, stores, factories, and gardens, students become familiar with the useful plants both in the natural form and as used by man. (Norton.)

BOT. 106 f. *History and Philosophy of Botany* (1)—One lecture.

Discussion of the development of the ideas and knowledge about plants, also a survey of contemporary workers in botanical science. (Norton.)

### Courses for Graduates

BOT. 201 s. *Histology and Cytology* (3)—One lecture; 2 laboratories. Prerequisite, Bot. 1.

A study of the technique involved in the preparation of permanent microscopic slides of plant materials. A detailed study of cell contents and cell reproduction, and the methods of illustrating same. The bearing of cytology upon theories of heredity and evolution will be emphasized. (Bamford.)

BOTANY 202 s. *Industrial Mycology* (3 or more)—One lecture and two or more laboratories.

Fungi in relation to canning, dairying, and other manufacturing processes; fermentation, sanitation, home economics, wood preservation, toxicology, soils, insect control, and other economic fields outside plant pathology. Part of the laboratory time to be spent in factories and technical laboratories. (Not offered in 1933-34.) (Norton.)

BOT. 204. *Research*. Credit according to work done. (Norton, Bamford.)

### B. Plant Pathology

#### Courses for Graduates and Advanced Undergraduates

PLT. PATH. 101 s. *Advanced Plant Pathology* (4)—Two lectures; two laboratories. Admission only after consultation with the instructor.

This course covers the nature, cause and control of plant diseases in a much more thorough manner than is possible in the elementary course, and,

in addition, it includes sufficient practice in technique to give the background for research. (Temple.)

PLT. PATH. 104 f and s. *Minor Investigations*—Credit according to work done. A laboratory course with an occasional conference. Prerequisite, Plt. Path. 1 f.

In this course the student may enter or withdraw at any time, including the summer months, and receive credit for the work accomplished. The course is intended primarily to give practice in technique so that the student may acquire sufficient skill to undertake fundamental research. Only minor problems or special phases of major problems may be undertaken. Their solution may include a survey of the literature on the problem under investigation and both laboratory and field work. (Temple and Norton.)

### Courses for Graduates

PLT. PATH. 201 f. *Virus Diseases* (2)—Two lectures.

An advanced course dealing with the mosaic and similar or related diseases of plants, including a study of the current literature on the subject and the working of a problem in the greenhouse. (Temple.)

PLT. PATH. 203 f. *Non-Parasitic Diseases* (3)—Two lectures; one laboratory.

Effects of maladjustment of plants to their environment; injuries due to climate, soil, gases, dusts and sprays, fertilizers, improper treatment and other detrimental conditions. (Not offered in 1932-1933.) (Norton.)

PLT. PATH. 204 f and s. *Seminar* (1).

Conferences and reports on plant pathological literature and on recent investigations. (Temple.)

PLT. PATH. 205 y. *Research*—Credit according to work done. (Norton, Temple.)

### C. Plant Physiology

#### Courses for Graduates and Advanced Undergraduates

PLT. PHYS. 101 s. *Plant Ecology* (3)—Two lectures; one laboratory. Prerequisite, Bot. 1 f or s.

The study of plants in relation to their environments. Plant formations and successions in various parts of the country are briefly treated. Much of the work, especially the practical, must be carried on in the field, and for this purpose type regions adjacent to the University are selected. (Fisher.)

#### Courses for Graduates

PLT. PHYS. 201 s. *Plant Biochemistry* (4)—Two lectures; two laboratories. Prerequisites, an elementary knowledge of plant physiology and organic chemistry.

An advanced course on the chemistry of plant life. It deals with materials and processes characteristic of plant life. Primary syntheses and the

transformations of materials in plants and plant organs are especially emphasized. (Appleman, Parker.)

PLT. PHYS. 202 f. *Plant Biophysics* (3 or 4)—Two lectures; one or two laboratories. Prerequisites, Bot. 1 f or Bot. 1 s, and Plt. Phys. 1 f or equivalent. An elementary knowledge of physics or physical chemistry is highly desirable.

An advanced course dealing with the operation of physical forces in life processes and physical methods of research in plant physiology. Practice in recording meteorological data constitutes a part of the course. (Greathouse.)

PLT. PHYS. 203 s. *Plant Microchemistry* (2)—One lecture; one laboratory. Prerequisites, Bot. 1 f or s, Chem. 1 y, or equivalents.

The isolation, identification, and localization of organic and inorganic substances found in plant tissues by micro-technical methods. The use of these methods in the study of metabolism in plants is emphasized. (Parker.)

PLT. PHYS. 204 s. *Growth and Development* (2)—Not given every year. (Appleman.)

PLT. PHYS. 205 f and s. *Seminar* (1).

The students are required to prepare reports of papers in the current literature. These are discussed in connection with the recent advances in the subject. (Appleman.)

PLT. PHYS. 206 y. *Research*—Credit hours according to work done.

Students must be specially qualified by previous work to pursue with profit the research to be undertaken. (Appleman, Greathouse.)

## CHEMISTRY

### General Chemistry

#### Courses for Graduates

CHEM. 200 y. *Advanced Inorganic Chemistry* (6)—Two lectures; one laboratory. Prerequisite, Chem. 6 y.

A study of the rarer elements is made by comparing their properties with those of the more common elements. The course is based upon the periodic system, the electromotive series, and the electronic structure of matter. The laboratory is devoted to the preparation of pure, inorganic substances, giving special attention to compounds of the rarer elements. (White.)

CHEM. 201 f and s. *Research in Inorganic Chemistry*—Open to students working for the higher degrees. Prerequisite, a Bachelor's degree in Chemistry or its equivalent. (White.)

### Analytical Chemistry

#### Courses for Graduates and Advanced Undergraduates

CHEM. 101 y. *Advanced Quantitative Analysis* (10)—Two lectures; three laboratories. Prerequisite, Chem. 6 y, or its equivalent.

A broad survey of the field of inorganic quantitative analysis. In the first semester mineral analysis will be given. Included in this will be



analysis of silicates, carbonates, etc. In the second semester the analysis of steel and iron will be taken up; however, the student will be given wide latitude as to the type of quantitative analysis he wishes to pursue during the second semester. (Wiley.)

CHEM. 103 y. *Advanced Industrial Analysis* (10)—Two lectures; three laboratories.

This course includes the analysis of alloys of industrial application. The interpretation of chemical analysis and correlation of chemical composition and physical properties. A limited amount of work will be done with the microscope. (Wiley.)

#### Courses for Graduates

CHEM. 202 f and s. *Research in Quantitative Analysis*—Open to students working for the higher degrees. Prerequisite, a Bachelor's degree in Chemistry or its equivalent. (Wiley.)

#### Organic Chemistry

##### Courses for Graduates and Advanced Undergraduates

CHEM. 116 y. *Advanced Organic Chemistry* (8 or 10)—Two lectures; two or three laboratory periods. Prerequisite, Chem. 8 f or s, or its equivalent. Course 116 y may be taken without the laboratory work. Graduate students may take the lectures (4 credits) only in this course and elect also Chem. 210 y.

This course is devoted to a more advanced study of the compounds of carbon than is undertaken in Chem. 8 f or s. The three credit laboratory course is required of graduate students specializing in chemistry. Seniors and juniors may take the two credit laboratory course. The laboratory work includes quantitative determinations of halogen, nitrogen, carbon, and hydrogen in organic substances, and also preparation work more difficult than that encountered in the elementary course. The laboratory work of the second half year will be devoted to organic qualitative analysis. Required of students specializing in chemistry. (Drake.)

#### Courses for Graduates

CHEM. 203 f and s. *Special Topics in Organic Chemistry* (2)—A lecture course which will be given any half-year when there is sufficient demand. The course will be devoted to an advanced study of topics which are too specialized to be considered in Chem. 116 y. Topics that may be covered are dyes, drugs, carbohydrates, plant pigments, etc. The subject matter will be varied to suit best the needs of the particular group enrolled. (Drake.)

CHEM. 204 f and s. *Special Topics in Organic Chemistry* (2)—A continuation of Chem. 203 f and s; will be given when there is sufficient demand. (Drake.)

CHEM. 205 f and s. *Organic Preparations* (4)—A laboratory course, devoted to the synthesis of various organic compounds. This course is de-

signed to fit the needs of those students whose laboratory experience has been insufficient for research in organic chemistry. (Drake.)

CHEM. 206 f and s. *Organic Micro Analysis* (4)—A laboratory study of the methods of Pregl for the quantitative determination of halogen, nitrogen, carbon, hydrogen, methoxyl, etc., in very small quantities of material. The course is open only to properly qualified graduate students, and the consent of the instructor is necessary before enrollment. (Drake.)

CHEM. 207 f and s. *Organic Qualitative Analysis* (4 or 6)—Laboratory work devoted to the identification of unknown organic compounds and mixtures.

CHEM. 210 y (4 or 6). *Advanced Organic Laboratory*—Students electing this course may take 4 lecture credits in Chem. 116 y.

CHEM. 211 f and s. *Research in Organic Chemistry*—Open to students working for the higher degrees. Prerequisite, a Bachelor's degree in Chemistry or its equivalent. (Drake.)

### Physical Chemistry

#### Courses for Graduates and Advanced Undergraduates

CHEM. 102 y. *Physical Chemistry* (10)—Three lectures; two laboratory periods. Prerequisites, Chem. 6 y; Physics 2 y; Math. 6 s. One semester may be taken for graduate credit with or without laboratory work. Graduate students may take lectures (6 credits) only in this course and elect also Chem. 219 f and s. With the consent of the instructor, graduate students may enter in the second semester.

This course aims to furnish the student with a thorough background in the laws and theories of chemistry. The gas laws, kinetic theory, liquids, solutions, elementary thermodynamics, thermochemistry, equilibrium, chemical kinetics, etc. (Haring.)

#### Courses for Graduates

NOTE: CHEM. 102 f and s or its equivalent is prerequisite for all advanced courses in physical chemistry.

CHEM. 212 f and s. *Colloid Chemistry* (8) or (4)—Two lectures; two laboratory periods; or two lectures only.

This is a thorough course in the chemistry of matter associated with surface energy. First semester, theory; second semester, practical applications. (Not given in 1932-1933.) (Haring.)

CHEM. 213 f. *Phase Rule* (2)—Two lectures. A systematic study of heterogeneous equilibria. One, two, and three component systems will be considered with practical applications of each. (Not given in 1932-1933.) (Haring.)

CHEM. 214 s. *Structure of Matter* (2)—Two lectures.

Subjects considered will be radioactivity, isotopes, the Bohr and Lewis-Langmuir theories of atomic structure, and allied topics. (Haring.)

CHEM. 215 f. *Catalysis* (2)—Two lectures.

This course consists of lectures on the theory and applications of catalysis. (Haring.)

CHEM. 216 s. *Theory of Solutions* (2)—Two lectures.

A detailed study will be made of the modern theory of ideal solutions, of the theory of electrolytic dissociation and of the recent developments of the latter. (Not given in 1932-1933.) (Haring.)

CHEM. 217 f and s. *Electrochemistry* (8) or (4)—Two lectures; two laboratory periods; or two lectures only.

A study of the principles and some of the practical applications of electrochemistry. First semester, theory; second semester, practical applications. (Haring.)

CHEM. 218 y. *Chemical Thermodynamics* (4)—Two lectures.

A study of the methods of approaching chemical problems through the laws of energy. (Haring.)

CHEM. 219 f and s. (4 or 6)—Two laboratory periods and one conference. Students taking this course may elect 6 credits of lectures in Chem. 102 y.

CHEM. 220 f and s. *Research in Physical Chemistry*—Open to students working for the higher degrees. Prerequisites, a Bachelor's degree in Chemistry or its equivalent and consent of the instructor. (Haring.)

## Agricultural Chemistry

### Courses for Graduates and Advanced Undergraduates

CHEM. 106 f and s. *Dairy Chemistry* (4)—One lecture; three laboratories. Prerequisite, Chem. 12 f.

Lectures and assigned reading on the constituents of dairy products. This course is designed to give the student a working knowledge and laboratory practice in dairy chemistry and analysis. Practice is given in examining dairy products for confirmation under the food laws, detection of watering, detection of preservatives and added colors, and the detection of adulterants. Students showing sufficient progress may take the second semester's work, and elect to isolate and make complete analysis of the fat or protein of milk. (McDonnell.)

CHEM. 108 s. *General Physiological Chemistry* (4)—Two lectures; two laboratories. Prerequisite, Chem. 12 f, or its equivalent.

A study of the chemistry of the fats, carbohydrates, proteins, and their fate in digestion and metabolism. (Broughton.)

CHEM. 115 f and s. *Organic Analysis* (4)—One lecture; three laboratories. Prerequisite, Chem. 6 y and 8 y.

This course gives a connected introductory training in organic analysis, especially as applied to plant and animal substances and their manufactured products. The greater part of the course is devoted to quantitative methods for food materials and related substances. Standard works and the publications of the Association of the Official Agricultural Chemists are used freely as references. (Broughton.)

### Courses for Graduates

CHEM. 221 f or s. *Tissue Analysis* (3)—Three laboratories. Prerequisite, Chem. 12 f or its equivalent.

A discussion and the application of the analytical methods used in determining the inorganic and organic constituents of plant and animal tissue. (Broughton.)

CHEM. 223 f. *Physiological Chemistry* (5)—Three lectures; two laboratories. Prerequisite, Organic Chemistry 12 f or its equivalent.

Lectures and laboratories on the study of the constitution and reactions of proteins, fats, carbohydrates, and allied compounds of biological importance. (Broughton.)

CHEM. 224 f or s. *Special Problems* (4 to 8)—A total of eight credit hours may be obtained in this course by continuing the course for two semesters. Laboratory, library and conference work amounting to ten hours each week. Prerequisites, Chem. 223 f and consent of instructor.

This course consists of studies of special methods such as the separation of the fatty acids from a selected fat, the preparation of certain carbohydrates or amino acids, and the determination of the distribution of nitrogen in a protein. The students will choose, with the advice of the instructor, the particular problem to be studied. (Broughton.)

CHEM. 227 f and s. *Research*—Agricultural chemical problems will be assigned to graduate students who wish to gain an advanced degree. (Broughton.)

## Industrial Chemistry

### Courses for Graduates and Advanced Undergraduates

CHEM. 110 y. *Industrial Chemistry* (6)—Three lectures. Prerequisites, Chem. 6 y and 8 y.

A study of the principal chemical industries; plant inspection, trips and reports; the preparation of an industrial report on some chemical industry. (Machwart.)

CHEM. 111 f. *Engineering Chemistry* (2)—Two lectures. A study of the chemistry of engineering materials. (Machwart.)

CHEM. 112 f and s. *Technical Methods* (3)—One lecture; two laboratories. Prerequisite, Chem. 6 y.

An examination of water from an industrial viewpoint. (Machwart.)

CHEM. 113 f. *Engineering Chemistry* (3)—Two lectures; one laboratory. (Designed for mechanical engineers.)

A study of water, lubricants, fuels and their combustion. Problems typical of engineering work. (Machwart.)

CHEM. 114 y. *Industrial Stoichiometry* (4)—Two lectures. A study of the stoichiometric relations existing in industry. Problems typical of industry. (Machwart.)

CHEM. 117 y. *Industrial Laboratory* (4)—Two laboratories. Prerequisite, consent of instructor. Experiments typical of industrial operations. Examination of materials. (Machwart.)

### Courses for Graduates

CHEM. 222 y. *Unit Operations* (6)—Three lectures. Prerequisite, consent of instructor.

A theoretical discussion of evaporation, distillation, filtration, etc. Problems. (Machwart.)

CHEM. 225 s. *Gas Analysis* (3)—One lecture; two laboratories. Prerequisite, consent of instructor.

Quantitative determination of common gases. Flue gas and water gas analysis including calorific determinations of the latter. Problems. (Machwart.)

CHEM. 228 f and s. *Research in Industrial Chemistry*—The investigation of special problems and the preparation of a thesis toward an advanced degree. (Machwart.)

### Chemical Seminar

CHEM. 226 f and s. (2)—Required of *all* graduate students in chemistry. The students are required to prepare reports of papers in the current literature. These are discussed in connection with the recent advances in the subject. (Chemistry Staff.)

## DAIRY HUSBANDRY

### Courses for Graduates and Advanced Undergraduates

D. H. 101 s. *Advanced Breed Study* (2)—One lecture; one laboratory. Breed Association rules and regulations, important families and individuals, pedigree studies. Work largely by assignment. (Ingham.)

D. H. 102 s. *Advanced Dairy Manufacturing* (3)—Hours to be arranged as to lecture and laboratory. Prerequisites, D. H. 4.

Plant and laboratory management, storage problems. Study of costs of production, accounting systems, purchase of equipment and supplies, market conditions, relation of the manufacturer to the shipper and dealer.

In this course the student will be required to act as helper and foreman and will be given an opportunity to participate in the general management of the dairy plant. Visits will be made to nearby dairies and ice-cream establishments. (Munkwitz.)

### Courses for Graduates

D. H. 201 y. *Special Problems in Dairying* (4-6)—Special problems which relate specifically to the work the student is pursuing will be assigned. Credit will be given in accordance with the amount and character of work done. (Meade.)

D. H. 202 y. *Seminar* (2)—Students are required to prepare papers based upon current scientific publications relating to dairying or upon their research work for presentation before and discussion by the class. (Staff.)

D. H. 203 y. *Research*—Credit to be determined by the amount and quality of work done. Students will be required to pursue, with the approval of the head of the department, an original investigation in some phase of dairy husbandry, carry the same to completion, and report the results in the form of a thesis. (Meade, Munkwitz, Ingham.)



## ECONOMICS AND SOCIOLOGY

### A. Economics

#### Courses for Graduates and Advanced Undergraduates

ECON. 101 f. *Money and Credit* (2)—Two lectures. Prerequisite, Econ. 3 y or consent of the instructor.

A study of the origin, nature, and functions of money, monetary systems, credit and credit instruments, prices, interest rates, and exchanges. (Brown.)

ECON. 102 s. *Banking* (2)—Two lectures. Prerequisites, Econ. 101 f.

Principles and practice of banking in relation to business. Special emphasis upon the Federal Reserve System. (Brown.)

ECON. 103 f. *Corporation Finance* (2)—Two lectures. Prerequisite, Econ. 3 y.

Principles of financing, the corporation and its status before the law, basis of capitilization, sources of capital funds, sinking funds, distribution of surplus, causes of failures, reorganizations, and receiverships. (Brown.)

ECON. 104 s. *Investments* (3)—Three lectures. Prerequisites, Econ. 3 y and senior standing.

Principles of investment, analyzing reports, price determination, taxation of securities, corporation bonds, civil obligations, real estate securities, and miscellaneous investments. Lectures, library assignments, and chart studies. (Brown.)

ECON. 107 f. *Business Law* (3)—Three lectures. Prerequisite, junior standing.

Legal aspects of business relationships, contracts, negotiable instruments, agency, partnerships, corporations, real and personal property, and sales. (Johnson.)

ECON. 108 s. *Business Law* (3)—Three lectures. Prerequisite, Econ. 107 f. A continuation of Econ. 107 f. (Johnson.)

ECON. 110 y. *Principles of Accounting* (6)—Three lectures. Prerequisite, Econ. 109 y.

A continuation of Introductory Accounting with emphasis placed upon the theory of accounting. Special phases of corporation accounting are studied. The introduction of accounting systems for manufacturing, commercial and financial institutions. (Wedeborg.)

ECON. 111 f. *Public Finance* (2)—Two lectures. Prerequisite, Econ. 3 y.

The nature of public expenditures, sources of revenue, taxation and budgeting. Special emphasis upon the practical, social and economic problems involved. (Johnson.)

ECON. 112 s. *Land Transportation* (3)—Three lectures. Prerequisite, Econ. 3 y or Econ. 5 f or s. Not open to students who receive credit in A. E. 101 s.

The development of inland means of transportation in the United States. This course is largely devoted to a survey of railway transportation. Some study is given to other transportation agencies. (Daniels.)

ECON. 113 f. *Public Utilities* (2)—Two lectures. Prerequisite, Econ. 3 y. The development of public utilities in the United States, economic and legal characteristics, regulatory agencies, valuation, rate of return and public ownership. (Johnson.)

ECON. 114 s. *Insurance* (3)—Three lectures. Prerequisite, Econ. 3 y. A survey of the major principles and practices of life and property insurance with special reference to its relationship to our social and economic life. (Johnson.)

ECON. 115 y. *History of Economic Theory* (4)—Two lectures. Prerequisite, Econ. 4 s and senior standing.

History of economic doctrines and theories from the eighteenth century to the modern period. (Johnson.)

ECON. 116 s. *Principles of Foreign Trade* (3)—Three lectures. Prerequisite, Econ. 3 y, Econ. 1 f, and Econ. 2 s or their equivalent.

The basic principles of import and export trade, as influenced by the differences in methods of conducting domestic and foreign commerce. (Daniels.)

ECON. 117 f. *Labor Problems* (3)—Three lectures. Prerequisite, Econ. 3 y or consent of the instructor.

The background of the labor problem, wage determination, unemployment and remedies for it, labor organizations, agencies for promoting industrial peace, the economic, social and political programs of labor at the present time. (Not given in 1932-1933.) (Brown.)

ECON. 119 f. *Advanced Economics* (2)—Two lectures. Prerequisites, Econ. 3 y and senior standing.

An analysis of the theories of contemporary economists. Special attention is given to the problems of value and distribution. (Brown.)

ECON. 120 s. *Applied Economics* (2)—Two lectures. Prerequisite, Econ. 119 f.

Current economic problems are studied from the viewpoint of the economist. Lectures and class discussions based on assigned readings. (Brown.)

ECON. 121 s. *Cost Accounting* (2)—Two lectures. Prerequisites, Econ. 109 y and consent of instructor.

Process cost accounting; specific order cost accounting; manufacturing expense; application of accounting theory; preparation of analytical statements. (Wedeborg.)

### Courses for Graduates

ECON. 201 y. *Thesis* (4-6)—Graduate standing. (Members of the staff.)

ECON. 203 y. *Seminar* (4)—Prerequisite, consent of instructor.

Designed to meet the needs of graduate students of the Department of Economics. Discussion of major problems in the field of economic theory. Presentation of reports based upon original investigations. (Staff.)

## B. Sociology

### Courses for Graduates and Advanced Undergraduates

Soc. 101 f. *Rural Sociology* (2)—Two lectures.

Historical approach to rural life; structure and functions of rural communities; rural institutions and their problems; psychology of rural life; statistical analysis of rural population; relation of rural life to the major social processes; the reshaping of rural life. (Bellman.)

Soc. 102 s. *Urban Sociology* (2)—Two lectures.

Historical survey of cities; statistical analysis of city groups; the nature and significance of the urbanization process; the social structure and functions of the city; urban personalities and groups; social change and problems due to the impact of the urban environment. (Bellman.)

Soc. 107 y. *Social Pathology and Social Work* (4)—Two lectures. Prerequisite, Soc. 1 f.

Causative factors and social complications in individual and group pathological conditions; types of social work and institutional treatment; the theory and technique of social case work; visits to major social agencies. (Not given in 1932-1933.) (Bellman.)

Soc. 115 f. *History of Social Theory* (3)—Three lectures. Prerequisites, Soc. 1 f and consent of instructor.

A survey of man's attempt to understand and explain the origin, nature, and laws of human society; the emergence and establishment of sociology as a social science. (Bellman.)

Soc. 116 s. *Contemporary Sociological Theories and Methods* (3)—Three lectures. Prerequisite, Soc. 115 f.

A survey of the most important contemporary sociological theories in combination with a general analysis of research methods used by the sociologist. (Bellman.)

(For other courses see Education, Agricultural Education and Rural Life.)

## EDUCATION

### A. History and Principles

#### Courses for Graduates and Advanced Undergraduates

Ed. 103 s. *Principles of Secondary Education* (3)—Required of all seniors in Education. Prerequisites, Ed. 101 f, Ed. 102 s, and full senior standing.

Evolution of the high school; European secondary education; articulation of the high school with the elementary school, college, and technical school, and with the community and the home; the junior high school; high school pupils; programs of study and the reconstruction of curricula; teaching staff; student activities. (Small.)

Ed. 104 f. *History of Education* (3)—Senior Elective.

History of the evolution of educational theory, institutions, and practices. Emphasis is upon the modern period. (Small.)



ED. 105 f. *Educational Sociology* (3)—Three lectures.

The sociological foundations of education; the major educational objectives; the function of educational institutions; the program of studies; objectives of the school subjects; group needs and demands; methods of determining educational objectives. (Cotterman.)

ED. 110 s. *The Junior High School* (3)—Senior Elective.

This course considers the functions of the Junior High School in the American public school system. Its development, present organization, curricula and relation to upper and lower grades will be emphasized. (Long.)

ED. 111 f. *Historical Backgrounds of Scientific Achievement* (2).

A study of the more important contributions to the progress of science with special attention upon the lives and characters of the men and women who made them. Stress is placed upon the discovery of pertinent historical and biographical writings suitable for use in high school classes. (Brechtbill.)

AG. ED. 106 s. *Rural Life and Education*. (See Agricultural Education.)

### Courses for Graduates

ED. 201 y. *Seminar in Education* (6)—(The course is organized in semester units.)

Problems in educational organization, administration and curriculum; study of current literature; individual problems. (Small.)

ED. 202 f. *College Teaching* (3)—One seminar period.

Analysis of the work of the college teacher; objectives; nature of subject matter; nature of learning; characteristics of college students; methods of college teachers; measuring results; extra-course duties; problems; investigations; reports. (Cotterman.)

ED. 203 s. *Problems in Higher Education* (3)—One double period a week. Lectures, surveys, and individual reports. Prerequisite, Ed. 202 f.

American collegiate education; status of the college teacher; collegiate education in foreign countries; demands upon institutions of higher learning; tendencies in the reorganization of collegiate education; curriculum problems; equipment for teaching. (Cotterman.)

ED. 204 s. *The Senior High School* (3).

This course will consider the principal's duties in relation to organization for operation, administration and supervision of instruction, and community relationships. (Long.)

ED. 251 y. *Research and Thesis* (6-8).

AG. ED. 203 S. *School and Community Studies*. (See Agricultural Education.)

### B. Educational Psychology

#### Courses for Graduates and Advanced Undergraduates

ED. 106 s. *Advanced Educational Psychology* (3)—Prerequisite, Ed. 101 f and Ed. 102 s. The latter may be taken concurrently with Ed. 106 s.

Principles of genetic psychology; nature and development of the human organism; development and control of instincts. Methods of testing intelli-

gence; group and individual differences and their relation to educational practice. Methods of measuring rate of learning; study of typical learning experiments. (Sprowls.)

ED. 107 f. *Educational Measurements* (3)—Prerequisites, Ed. 101 f and Ed. 102 s.

A study of typical educational problems involving educational scales and standard tests. Nature of tests, methods of use, analysis of results and practical applications in educational procedure. Emphasis will be upon tests for high school subjects. (Sprowls.)

ED. 108 s. *Mental Hygiene* (3)—Prerequisite, Ed. 101 f or Psychol. 1 f or s, or equivalent.

Normal tendencies in the development of character and personality. Solving problems of adjustment to school and society; obsessions, fears, compulsions, conflicts, inhibitions, and compensations. Methods of personality analysis. (Sprowls.)

### Courses for Graduates

ED. 206 y. *Seminar in Psychology* (6).

For candidates for advanced degrees who are working on special problems. Hours to be arranged. (Sprowls.)

ED. 252 y. *Research and Thesis* (6-8).

### C. Methods in High School Subjects

#### Courses for Graduates and Advanced Undergraduates

ED. 120 f. *English in the High School* (4)—Prerequisites, Ed. 101 f, Ed. 102 s.

Objectives in English in the different types of high schools; selection and organization of subject-matter in terms of modern practice and group needs; evaluation of texts and references; bibliographies; methods of procedure and types of lessons; the use of auxiliary materials; lesson plans; measuring results. (Smith.)

ED. 121 f or s. *Supervised Teaching of English* (3)—Observation and supervised teaching. Minimum of 20 teaching periods required. (Smith.)

ED. 122 f. *The Social Studies in the High School* (4)—Prerequisites, Ed. 101 f, Ed. 102 s.

Selection and organization of subject-matter in relation to the objectives and present trends in the Social Studies; texts and bibliographies; methods of procedure and types of lessons; the use of auxiliary materials; lesson plans; measuring results. (Long.)

ED. 123 f or s. *Supervised Training of the Social Studies* (3)—Observation and supervised teaching. Minimum of 20 teaching periods required. (Long.)

ED. 124 f. *Modern Language in the High School* (4)—Prerequisites, Ed. 101 f, Ed. 102 s.

Objectives of modern language teaching in the high school; selection and organization of subject-matter in relation to modern practice and group

needs; evaluation of texts and references; bibliographies. Methods of procedure and types of lessons; lesson plans; special devices; measuring results.

ED. 125 f or s. *Supervised Teaching of Modern Language* (3)—Observation and supervised teaching. Minimum of 20 teaching periods required.

ED. 126 f. *Science in the High School* (4)—Prerequisites, Ed. 101 f, Ed. 102 s.

Objectives of science teaching, their relation to the general objectives of secondary education; application of the principles of psychology and of teaching to the science class room situation; selection and organization of subject-matter; history, trends and status; textbooks, reference works and laboratory equipment. Technic of class room and laboratory; measurement, standardized tests; professional organizations and literature; observation and criticism. (Brechtbill.)

ED. 127 f or s. *Supervised Teaching of Science* (3)—Observation and supervised teaching. Minimum of 20 teaching periods required. (Brechtbill.)

ED. 128 f. *Mathematics in the High School* (4)—Prerequisites, Ed. 101 f, Ed. 102 s.

Objectives; the place of mathematics in secondary education; content and construction of courses; recent trends; textbooks and equipment; methods of instruction; measurement and standardized tests; professional organizations and literature; observation and criticism. (Brechtbill.)

ED. 129 f or s. *Supervised Teaching of Mathematics* (3)—Observation and supervised teaching. Minimum of 20 teaching periods required. (Brechtbill.)

#### D. Home Economics Education

##### Courses for Graduates

H. E. ED. 200 f. *Seminar in Home Economics Education* (3-5)—Principles of progressive education as applied to the teaching of home economics; study of early educational experiments as compared with advanced schools of the present day; the adaptation of home economics to present needs. (McNaughton.)

### ENGLISH LANGUAGE AND LITERATURE

#### Courses for Graduates and Advanced Undergraduates

ENG. 105 s. *Poetry of the Romantic Age* (3)—Three lectures. Prerequisite, Eng. 7 f and 8 s or Comp. Lit. 105, first semester. A study of the Romantic movement in England as illustrated in the works of Shelley, Keats, Byron, Wordsworth, Coleridge. (Hale.)

(This course is identical with the second semester of Comp. Lit. 105 y.)

ENG. 115 f. *Literature of the Eighteenth Century* (2)—Two lectures. Prerequisite, Eng. 7 and 8. Readings in the period dominated by Defoe, Swift, Addison, Steele, and Pope. (Macbeth.)

ENG. 116 s. *Literature of the Eighteenth Century* (2)—Two lectures. Prerequisite, Eng. 7 and 8. A continuation of Eng. 115 f. Dr. Johnson and his Circle; the Rise of Romanticism; the Letter Writers. (Macbeth.)

ENG. 117 y. *Medieval Romance in England* (4)—Two lectures. Prerequisite, Eng. 7 f. Lectures and readings in the cyclical and non-cyclical romances in Medieval England and their sources, including translations from the Old French. (Hale.)

ENG. 118 y. *The Major Poets of the Fourteenth Century* (4)—Two lectures. Prerequisite, Eng. 7 f. Lectures and assigned readings in the works of Langland, Gower, Chaucer, and other poets of the fourteenth century. (Not given in 1932-1933.) (Hale.)

ENG. 119 y. *Anglo-Saxon* (6)—Three lectures. Some knowledge of Latin and German is desirable, as a preparation for this course. Required of all students whose major is English.

A study of Anglo-Saxon (Old English) grammar and literature. Lectures on the principles of comparative philology and phonetics. (House.)

ENG. 122 f. *The Novel* (2)—Two lectures.

Lectures on the principles of narrative structure and style. Class reviews of selected novels, chiefly from English and American sources. (House.)

ENG. 123 s. *The Novel* (2)—Two lectures.

Continuation of Eng. 122 f. (House.)

ENG. 124 f. *English and American Essays* (2)—Two lectures.

A study of the philosophical, critical, and familiar essays of England and America. Bacon, Lamb, Macaulay, Emerson, Chesterton, and others. (House.)

ENG. 126 f. *Victorian Poets* (2)—Two lectures.

Studies in the poetry of Tennyson, Browning, Arnold, Swinburne, and others. (House.)

ENG. 127 s. *Victorian Poets* (2)—Two lectures.

Continuation of Eng. 126 f. (House.)

ENG. 129 f. *College Grammar* (3)—Three lectures. Required of all students whose major is English.

Studies in the descriptive grammar of modern English, with some account of the history of forms. (Harman.)

ENG. 130 f. *The Old Testament as Literature* (2)—Two lectures. For seniors and graduate students.

A study of the sources, development, and literary types. (Hale.)

### Courses for Graduates

ENG. 201. *Thesis*—Credit proportioned to the amount of work and ends accomplished.

Original research and the preparation of dissertations looking toward advanced degrees. (Staff.)

ENG. 202 y. *Beowulf* (4)—Two lectures. Prerequisite, Eng. 119 y.

Critical study of grammar and versification, with some account of the legendary lore. Alternate with Eng. 203 f and 204 s. (Harman.)

ENG. 203 f. *Middle English* (2)—Two lectures. Prerequisite, Eng. 119 y.

A study of excerpts of the Middle English period, with reference to etymology and syntax. (House or Harman.)

ENG. 204 s. *Gothic* (2)—Two lectures. Prerequisite, Eng. 119 y.

A study of the forms and syntax, with readings from the *Ulfilas Bible*. Correlation of Gothic speech sounds with those of Old English. Eng. 203 f and 204 s alternate with Eng. 202 y. (House.)

ENG. 205 s. *Browning's Dramas* (2)—Two lectures. *Luria, The Return of the Druses, Pippa Passes, Colombe's Birthday, A Blot in the 'Scutcheon*. (House.)

ENG. 206 f. *Victorian Prose* (2)—Two lectures. Works of Carlyle, Arnold, Mill, Ruskin, and others. (Hale.)

## ENTOMOLOGY

### Courses for Graduates and Advanced Undergraduates

ENT. 101 y. *Economic Entomology* (6)—Three lectures.

An intensive study of the problems of applied entomology, including life history, ecology, behavior, distribution, parasitism, and control. (Cory.)

ENT. 102 y. *Economic Entomology* (4)—Two laboratories.

Expansion of Ent. 101 y to include laboratory and field work in economic entomology. (Cory.)

ENT. 103 y. *Seminar* (1)—Time to be arranged.

Presentation of original work, book reviews, and abstracts of the more important literature. (Cory.)

ENT. 104 y. *Insect Pests of Special Groups* (6)—Prerequisite, Ent. 1 f or s.

A study of the principal insects of one or more of the following groups, founded upon food preferences and habitat. The course is intended to give the general student a comprehensive view of the insects that are of importance in his major field of interest and detailed information to the student specializing in entomology.

Insect Pests of: 1, Fruit; 2, Vegetables; 3, Flowers, both in the open and under glass; 4, Ornamentals and Shade Trees; 5, Forests; 6, Field Crops; 7, Stored Products; 8, Live Stock; 9, The Household. (Cory, Knight.)

ENT. 105 f. *Medical Entomology* (3)—Three lectures. Prerequisite, Ent. 1 or consent of instructor.

The relation of insects to diseases of man, directly and as carriers of pathogenic organisms. Control of pests of man. The fundamentals of parasitology. (Knight.)

### Courses for Graduates

ENT. 201. *Advanced Entomology* (2).

Studies of minor problems in morphology, taxonomy, and applied entomology, with particular reference to preparation for individual research. (Cory.)

ENT. 202 y. *Research in Entomology* (6-10).

Advanced students having sufficient preparation, with the approval of the head of the department, may undertake supervised research in morphology,



taxonomy, or biology and control of insects. Frequently the student may be allowed to work on Station or State Horticultural Department projects. The student's work may form a part of the final report on the project and be published in bulletin form. A dissertation, suitable for publication, must be submitted at the close of the studies as a part of the requirements for an advanced degree. (Cory.)

ENT. 203. *Insect Morphology* (2-4).

Insect Anatomy with special relation to function. Given particularly in preparation for work in physiology and other advanced studies. Two lectures, and laboratory work by special arrangement, to suit individual needs. (Snodgrass.)

(NOTE: Course 203 begins on November 15 and closes on March 15, and is taught at 4:30 p. m. in order to accommodate field workers.)

ENT. 204 y. *Economic Entomology* (6)—Three lectures. Studies of the principles underlying applied entomology, and the most significant advances in all phases of entomology. (Cory.)

## FOODS AND NUTRITION

### Courses for Graduates and Advanced Undergraduates

H. E. 131 f. *Nutrition* (3)—Three recitations. Prerequisites, H. E. 31 y and Elements of Organic Chemistry (Chem. 12 f).

Nutritive value, digestion and assimilation of foods. (Welsh.)

H. E. 132 s. *Nutrition* (3)—Two recitations; one laboratory. Prerequisite, H. E. 131 f.

Selection of food to promote health; pathological diets as treated in the home; children's diets. (Welsh.)

H. E. 134 s. *Advanced Foods* (3)—One recitation; two laboratories. Prerequisite, H. E. 31 y.

Advanced cookery and catering. (Welsh.)

H. E. 135 f. *Problems and Practice in Foods* (5).

Commercial experience in foods or food research. (Welsh.)

H. E. 136 s. *Child Nutrition* (2)—One recitation; one laboratory.

Lectures, discussions and field trips relating to the principles of child nutrition. (Welsh.)

### Courses for Graduates

H. E. 201 f or s. *Seminar in Nutrition* (3).

Oral and written reports on assigned readings in the current literature of Nutrition. Preparation and presentation of reports on special topics. (Staff.)

H. E. 202 f or s. *Special Problems in Foods*. Credits to be determined by amount and quality of work done.

With the approval of the head of the department, students may pursue an original investigation in some phase of foods. The results may form the basis of a thesis for an advanced degree. (Welsh.)

H. E. 203 f or s. *Advanced Nutrition* (3)—One recitation; two laboratories.

A survey of methods of feeding experiments with an opportunity to conduct such experiments with small laboratory animals. (Welsh.)

## GENETICS AND STATISTICS

### Courses for Graduates and Advanced Undergraduates

GEN. 101 f. *Genetics* (3)—Three lectures.

A general course designed to give an insight into the principles of genetics or of heredity, and also to prepare students for later courses in the breeding of animals or of plants. (Kemp.)

GEN. 102 s. *Advanced Genetics* (3)—Two lectures; one laboratory. Prerequisites, Gen. 101 f. Alternate year course.

A consideration of chromosome irregularities and other mutations, interspecies crosses, genetic equilibrium, and the results of artificial attempts to modify germplasm. (Kemp.)

GEN. 111 f. *Statistics* (2)—Two lectures.

A study of the collection, analysis, interpretation, and presentation of statistics. The course includes a study of expressions of type, variability, and correlation, together with the making of diagrams, graphs, charts, and maps. (Kemp.)

GEN. 112 s. *Advanced Statistics* (2)—Two lectures. Prerequisites, Gen. 111 f or its equivalent.

A study of the theory of error, measures of relationship, multiple and partial correlation, predictive formulas, curve fitting. (Kemp.)

### Courses for Graduates

GEN. 201 y. *Crop Breeding*—Credits determined by work accomplished. (Kemp.)

GEN. 209 y. *Research*—Credit determined by work accomplished. (Kemp.)

## HISTORY AND POLITICAL SCIENCE

### A. History

### Courses for Graduates and Advanced Undergraduates

H. 101 f. *American Colonial History* (3)—Three lectures and assignments. Prerequisite, H. 2 y.

A study of the political, economic, and social development of the American people from the discovery of America through the formation of the Constitution. (Crothers.)

H. 102 s. *Recent American History* (3)—Three lectures. Prerequisite, H. 2 y.

The history of national development from the close of the reconstruction period to the present time. (Crothers.)

H. 103 y. *American History 1790-1865* (4)—Two lectures. Prerequisite, H. 2 y.

The history of national development to the reconstruction period. (Alternates with H 106 y.) (Not given in 1932-1933.) (Crothers.)

H. 104 y. *World History Since 1914* (6)—Three lectures.

A study of the principal nations of the world since the outbreak of the World War. (Alternates with H. 105 y.) (Not given in 1932-1933.) (Jaeger.)

H. 105 y. *Diplomatic History of Europe in the Nineteenth and Twentieth Centuries* (6)—Three lectures.

A study of the European nations, stressing their political problems and their political activities. (Alternates with H. 104 y.) (Jaeger.)

H. 106 y. *American Diplomacy* (4)—Two lectures.

A study of American foreign policy. (Alternates with H. 103 y.) (Crothers.)

H. 107 y. *Social and Economic History of the United States, 1607 to the present time* (4)—Two lectures.

An advanced history course giving a synthesis of American life. (Crothers.)

### Courses for Graduates

H. 200 y. *Research and Thesis*. Credit according to work accomplished.

H. 201 y. *Seminar American History* (2). (Crothers.)

H. 202 y. *Seminar European History* (2). (Jaeger.)

### B. Political Science

#### Courses for Graduates and Advanced Undergraduates

POL. SCI. 101 f. *International Law* (3)—Two lectures and cases.

A study of the sources, nature, and sanction of international law, peace, war, and neutrality. (Jaeger.)

POL. SCI. 102 s. *International Relations* (3)—Lectures and conferences.

An examination of the economic and political reasons that motivate nations in their relations with one another. This course is designed to give the student a clear insight into the *actual causes*, whether economic or otherwise, that induce States to adopt one policy or another in the international sphere of their activity. (Jaeger.)

### HORTICULTURE

#### Courses for Graduates and Advanced Undergraduates

HORT. 101 f. *Commercial Fruit Growing* (3)—Two lectures; one laboratory. Prerequisite, Hort. 1 f.

The proper management of commercial orchards in Maryland. Advanced work is taken up on the subject of orchard culture, orchard fertilization, picking, packing, marketing, and storing of fruits; orchard by-products; orchard heating, and orchard economics. (Not offered in 1932-1933.) Given in alternate years. (Wentworth.)

HORT. 102 f. *Economic Fruits of the World* (2)—Two lectures. Prerequisites, Hort. 1 f.

A study is made of the botanical, ecological, and physiological characteristics of all species of fruit-bearing plants of economic importance, such as the date, pineapple, fig, olive, banana, nut-bearing trees, citrus fruits, and newly introduced fruits, with special reference to their cultural requirements in certain parts of the United States and the insular possessions. All fruits are discussed in this course which have not been discussed in a previous course. (Offered in 1932-1933.) Given in alternate years. (Wentworth.)

HORT. 103 f. *Tuber and Root Crops* (2)—One lecture; one laboratory. Prerequisites, Hort. 11 s. (Offered in 1932-1933.) Given in alternate years.

A study of white potatoes and sweet potatoes, considering seed, varieties, propagation, soils, fertilizers, planting, cultivation, spraying, harvesting, storing, and marketing. (Cordner.)

HORT. 104 s. *Advanced Truck Crop Production* (1)—Prerequisites, Hort. 11 s and 12 f.

A trip of one week is made to the commercial trucking section of Maryland, Delaware, New Jersey, and Pennsylvania. A study of the markets in several large cities is included in this trip. Students are required to hand in a detailed report of this trip. The cost of such a trip should not exceed thirty dollars per student. The time will be arranged each year with each class. (Hort. Staff.)

HORT. 105 f. *Systematic Olericulture* (3)—Two lectures; one laboratory. Prerequisites, Hort. 11 s. (Offered in 1932-1933.) Given in alternate years.

A study of the classification and nomenclature of vegetables. Descriptions of varieties and adaptation of varieties to different environmental conditions. (Boswell.)

HORT. 106 y. *Plant Materials* (5)—One lecture; one or two laboratories. (Not offered in 1932-1933.) Given in alternate years.

A field and laboratory study of trees, shrubs, and vines used in ornamental planting. (Thurston.)

### Courses for Graduates

HORT. 201 y. *Experimental Pomology* (6)—Three lectures.

A systematic study of the sources of knowledge and opinion as to practices in pomology; methods and difficulties in experimental work in pomology and results of experiments that have been or are being conducted in all experiment stations in this and other countries. (Auchter.)

HORT. 202 y. *Experimental Olericulture* (6)—Three lectures.

A systematic study of the sources of knowledge and opinion as to practices in vegetable growing; methods and difficulties in experimental work in vegetable production and results of experiments that have been or are being conducted in all experiment stations in this and other countries. (Boswell.)

HORT. 203 s. *Experimental Floriculture* (2)—Two lectures.

A systematic study of the sources of knowledge and opinion as to practice in floriculture are discussed in this course. The results of all experimental work in floriculture which have been or are being conducted will be thoroughly discussed. (Thurston.)

HORT. 204 s. *Methods of Research* (2)—One lecture; one laboratory.

For graduate students only. Special drill will be given in the making of briefs and outlines of research problems, in methods of procedure in conducting investigational work, and in the preparation of bulletins and reports. A study of the origin, development, and growth of horticultural research is taken up. A study of the research problems being conducted by the Department of Horticulture will be made, and students will be required to take notes on some of the experimental work in the field and become familiar with the manner of filing and cataloging all experimental work. (Auchter.)

HORT. 205 y. *Advanced Horticultural Research and Thesis* (4, 6 or 8).

Graduate students will be required to select problems for original research in pomology, vegetable gardening, floriculture, or landscape gardening. These problems will be continued until completed, and final results are to be published in the form of a thesis. (Auchter, Boswell, Schrader, Gardner.)

HORT. 206 y. *Advanced Horticultural Seminar* (2).

This course will be required of all graduate students. Students will be required to give reports either on special topics assigned them, or on the progress of their work being done in courses. Members of the departmental staff will report special research work from time to time. (Auchter.)

#### Special Requirements of Graduate Students in Horticulture

*Pomology*—Graduate students specializing in pomology who are planning to take an advanced degree will be required to take or offer the equivalent of the following courses: Hort. 1 f, 2 f, 101 f, 102 f, 201 y, 204 s, 205 y, and 206 y; General Biochemistry 102 f; Plant Microchemistry 203 s; Plant Biochemistry 201 s; Plant Biophysics 202 f; Plant Ecology (Plt. Phys. 101 s), and Organic Chemistry (Chem. 8 y).

*Olericulture*—Graduate students specializing in vegetable gardening who are planning to take an advanced degree will be required either to take or offer the equivalent of the following courses: Hort. 12 f, 13 s, 103 f, 105 f, 202 y, 204 s, 205 y, and 206 y; General Biochemistry 102 f; Plant Microchemistry 203 s; Plant Biochemistry 201 s; Plant Biophysics 202 f; Plant Ecology (Plt. Phys. 101 s), and Organic Chemistry (Chem. 8 y).

*Floriculture*—Graduate students specializing in floriculture who are planning to take an advanced degree will be required to take or offer the equivalent of the following courses: Hort. 22 y, 23 y, 24 s, 25 y, 26 f, 203 s, 204 s, 205 y and 206 y; General Biochemistry 102 f; Plant Microchemistry 203 s; Plant Biophysics 202 f; Plant Biochemistry 201 s; Botany 103 f or s, and Organic Chemistry (Chem. 8 y).

*Landscape Gardening*—Graduate students specializing in landscape gardening who are planning to take an advanced degree will be required to take or offer the equivalent of the following courses: Hort. 32 f, 33 s, 35 f, 105 f, 204 s, and 206 y; Botany 103 f or s; Drafting 1 y and 2 y, and Plane Surveying 1 f and 2 s.

*Additional Requirements*—In addition to the above required courses, all graduate students in horticulture are advised to take physical and colloidal chemistry.



Unless graduate students in horticulture have had some course work in entomology, plant pathology, genetics, and biometry, certain of these courses will be required.

*Note:* For courses in Biochemistry and Biophysics, see Botany.

## MATHEMATICS

### Courses for Graduates and Advanced Undergraduates

MATH. 103 f. *Differential Equations* (3)—Three lectures. Elective. Prerequisite, Math. 7 y.

Integration of ordinary differential equations. Singular solutions. Integration by Series. Applications to Geometry, Physics, etc. (Yates.)

MATH. 104 s. *Theoretical Mechanics* (3)—Three lectures. Elective. Prerequisite, Math. 7 y.

Elementary Vector Analysis. Statics. Kinematics. The equations of Motion. Applications. (Alrich.)

MATH. 105 f. *Advanced Topics in Algebra* (3)—Three lectures. Elective. Theory of Equations. Galois Groups. Matrices and Determinants. Linear Substitutions. Quadratic Forms. (Dantzig.)

MATH. 106 s. *Advanced Topics in Geometry* (3)—Three lectures. Elective.

The Conic Sections. Homogeneous Co-ordinates. The Quadric Surfaces. Collineations. Principles of Projective Geometry. (Dantzig.)

MATH. 107 f. *Elementary Theory of Functions* (3)—Three lectures. Elective.

Functions of a Real Variable. Polynomials and Rational Functions. Transcendental Functions. Principles of Graphing and of Approximation. (Not given in 1932-1933.) (Dantzig.)

MATH. 108 s. *Vector Analysis* (3)—Three lectures. Elective.

Vector Algebra. Applications to geometry and physics. Vector differentiation and integration. Applications to mathematical physics. (Not given in 1932-1933.) (Dantzig.)

MATH. 111 f. *History of Mathematics* (3)—Three lectures. Elective.

The courses will deal with the historical development of mathematical ideas and methods. Special emphasis will be placed on the Greek period and the period of Revival of Learning. The history of Arithmetic, Algebra and Geometry will receive particular attention. (Not given in 1932-1933.) (Taliaferro.)

### Courses for Graduates

MATH. 201 y. *Seminar and Thesis* (4-10)—Credit hours will be given in accordance with work done. (Dantzig.)

MATH. 202 f. *Fundamental Concepts of Mathematics* (2)—Two lectures.

A historical and critical survey of the Number Concept, Limit and Infinitesimals. The space, and the various geometries. The concept of time and one Relativity Theory. The concept of chance and its application to natural and social sciences. (Not given in 1932-1933.) (Dantzig.)

MATH. 203 s. *Theory of Transformations* (2)—Two lectures.

Mathematical operations. The idea of Group. The Metric Group. The Projective Group. The Conformal Group. Invariants. (Not given in 1932-1933.) (Dantzig.)

MATH. 204 s. *Selected Topics in Mathematics* (3)—Three lectures.

This course, designed for advanced students in the sciences, begins with a brief review of calculus, mechanics, and elementary differential equations. Particular attention will be paid to consideration of problems in vibration with applications to molecular structure. Special topics, which will also be briefly treated, include a study of the wave equation, Fourier's Series, Harmonic Analysis, Gamma and Beta functions, Legendre polynomials, etc. (Yates.)

## MODERN LANGUAGES

### A. French

#### Courses for Graduates and Advanced Undergraduates

(French 4 y, 5 y, 6 f and 7 s, or equivalent, are prerequisite for courses in this group.)

FRENCH 101 f. *History of French Literature in the Seventeenth Century* (3)—Three lectures. (Not given in 1932-1933.) (Wilcox.)

FRENCH 102 s. *History of French Literature in the Eighteenth Century* (3)—Three lectures. (Not given in 1932-1933.) (Wilcox.)

FRENCH 103 f. *History of French Literature in the Nineteenth Century* (3)—Three lectures. (Not given in 1932-1933.) (Wilcox.)

FRENCH 104 s. *History of French Literature in the Nineteenth Century* (3)—Three lectures. Continuation of French 103 f. (Not given in 1932-1933.) (Wilcox.)

FRENCH 105 f. *The Renaissance in France* (3)—Three lectures. Study of the literature of the period. (Wilcox.)

FRENCH 106 s. *The Renaissance in France* (3)—Three lectures. Continuation of French 105 f. (Wilcox.)

Attention is also called to Comparative Literature 105, *Romanticism in France, Germany, and England*.

#### Courses for Graduates

FRENCH 201 y. *Research and Thesis*. Credits determined by work accomplished.

FRENCH 207 f. *The Middle Ages in France* (3)—Three lectures.

Introduction to the study of the literature of the period, with some attention given to etymology and historical grammar. This course is strongly recommended to all those majoring in French.

FRENCH 208 s. *The Middle Ages in France* (3)—Three lectures. Continuation of French 207 f.

## B. German

### Courses for Graduates and Advanced Undergraduates

(Prerequisite for courses in this group, German 4 and 5 or equivalent.)

GERMAN 101 f. *German Literature of the Eighteenth Century* (3)—Three lectures. The earlier classical literature. (Not given in 1932-1933.) (Zucker.)

GERMAN 102 s. *German Literature in the Eighteenth Century* (3)—Three lectures. The later classical literature. (Not given in 1932-1933.) (Zucker.)

GERMAN 103 f. *German Literature of the Nineteenth Century* (3)—Three lectures. Romanticism and young Germany. (Zucker.)

GERMAN 104 s. *German Literature of the Nineteenth Century* (3)—Three lectures. The literature of the Empire. (Zucker.)

### Courses for Graduates

GERMAN 205 y. *Research and Thesis*—Credits determined by work accomplished. (Zucker.)

## C. Spanish

### Courses for Graduates

SPANISH 201 f. *The Middle Ages in Spain* (3)—Three lectures.

Introduction to the study of the literature of the period, with some attention given to etymology and historical grammar. This course is strongly recommended to all those majoring in Spanish.

SPANISH 202 s. *The Middle Ages in Spain* (3)—Three lectures.

Continuation of Spanish 201 f.

SPANISH 203 y. *Research and Thesis*. Credits determined by work accomplished.

## D. Comparative Literature

### Courses for Graduates and Advanced Undergraduates

The courses in Comparative Literature are, for the time being, under the direction of the Department of Modern Languages. They may be elected as partially satisfying major or minor requirements in this department. Comparative Literature 101 f, 102 s, 104 s, and 105 y may also be counted toward a major or minor in English.

COM. LIT. 101 f. *Introduction to Comparative Literature* (3)—Three lectures.

Survey of the background of European literature through study in English translation of Greek and Latin literature. Special emphasis is laid on the development of the epic, tragedy, comedy, and other typical forms of literary expression. The debt of modern literature to the ancients is discussed and illustrated. (Zucker.)

COM. LIT. 102 s. *Introduction to Comparative Literature* (3)—Three lectures.

Continuation of 101 f; study of medieval and modern Continental literature. (Zucker.)

COM. LIT. 104 s. *The Modern Ibsen* (2)—Lectures on the life of Ibsen and the European drama in the middle of the Nineteenth Century. Study of Ibsen's social and symbolical plays in Archer's translation. (Zucker.)

COM. LIT. 105 y. *Romanticism in France, Germany and England* (6)—Two lectures and reports.

Introduction to the chief authors of the Romantic movement in England, France, and Germany, the latter two groups being read in English translation. Lectures on the chief thought currents and literary movements of the late eighteenth and early nineteenth centuries. First semester: Rousseau to Gautier; Buerger to Heine. Second semester: Wordsworth, Coleridge, Landor, Byron, Shelley, Keats, and others. The course is conducted by members of both the Modern Language and the English departments. (Wilcox, Zucker, Hale.)

### For Graduates

M. L. 202 s. *Modern Language Seminar* (1)—Required of all graduate students majoring in modern languages.

## PHYSICS

### Courses for Graduates and Advanced Undergraduates

PHYS. 101 f. *Physical Measurements* (3)—Two lectures; one laboratory. Elective. Prerequisite, Phys. 1 y or 2 y.

This course is designed for the study of physical measurements and for familiarizing the student with the manipulation of the types of apparatus used in experimentation in physical problems. (Clark.)

PHYS. 102 y. *Graphic Physics* (2)—One lecture. Elective. Prerequisite, Phys. 1 y or 2 y.

A study of physical laws and formulae by means of scales, charts, and graphs. (Eichlin.)

PHYS. 103 f. *Advanced Physics* (3)—Two lectures; one laboratory. Required of students in the Industrial Chemistry curriculum. Elective for other students. Prerequisite, Phys. 2 y.

An advanced study of Molecular Physics, wave motion, and heat. (Eichlin.)

PHYS. 104 s. *Advanced Physics* (3)—Two lectures; one laboratory. Elective. Prerequisite, Phys. 2 y.

An advanced study of electricity and magnetism. (Eichlin.)

PHYS. 105 y. *Advanced Physics* (6)—Three lectures. Elective. Prerequisite, Phys. 1 y or 2 y.

A study of physical phenomena in optics, spectroscopy, conduction of electricity through gases, etc., with a comprehensive review of their basic underlying principles. (Eichlin.)

## Courses for Graduates

PHYS. 201 y. *Modern Physics* (6)—Three lectures. Elective.

A study of some of the problems encountered in modern physics. (Eichlin.)

## PSYCHOLOGY

### Courses for Graduates and Advanced Undergraduates

See "Education" for description of the following courses:

ED. 106 s. *Advanced Educational Psychology* (3).

ED. 107 f. *Educational Measurements* (3).

ED. 108 s. *Mental Hygiene* (3).

### Courses for Graduates

ED. 206 y. *Seminar in Psychology*. (Sprowls.)

ED. 252 y. *Research and Thesis* (6-8).

## ZOOLOGY AND AQUICULTURE

### Courses for Graduates and Advanced Undergraduates

ZOOL. 101 f. *Embryology* (4)—Two lectures; two laboratories. Prerequisite, two semesters of biology, one of which should be in this department. Required of three-year pre-medical students.

The development of the chick to the end of the fourth day. (Pierson, Burhoe.)

ZOOL. 102 y. *Mammalian Anatomy* (2-3)—A laboratory course. Prerequisite, one year of zoology.

A thorough study of the gross anatomy of the cat or other mammal. Open to a limited number of students. The permission of the instructor must be obtained before registration. Schedule to be arranged. (Pierson.)

ZOOL. 103 y. *Journal Club* (1)—Reviews, reports, and discussions of current literature. Required of students selecting Zoology and Aquiculture as the principal department in the major group. (Staff.)

ZOOL. 104 y. *Animal Physiology* (3)—Two lectures and one laboratory. A general and particular study of the phenomena exhibited by animal organisms. Particular stress, both in lecture and in laboratory, is placed upon mammalian and human physiological activity. Registration is limited to 12 and the permission of the instructor must be obtained before registration. (Phillips.)

ZOOL. 105 y. *Aquiculture* (2)—Lectures and laboratory to be arranged. Prerequisites, one course in general zoology and one in general botany.

Plankton studies and the determination of other aquatic life of nearby streams and ponds. Morphology and ecology of representative commercial and game fishes in Maryland, the Chesapeake blue crab, and the oyster. (Truitt.)

ZOOL. 110 s. *Organic Evolution* (2)—Two lectures. Prerequisites, two semesters of biological science, one of which must be in this department.



The object of this course is to present the zoological data on which the theory of evolution rests. The lectures will be supplemented by discussion, collateral reading, and reports. Not given every year. (Pierson.)

ZOOL. 115 y. *Vertebrate Zoology*—Credit hours and schedule to be arranged to suit the individual members of the class.

Each student may choose, within certain limits, a problem in taxonomy, morphology, or embryology. Prerequisite, Zool. 8 f or its equivalent. (Pierson.)

ZOOL. 120 s. *Genetics* (3)—Two lectures; one laboratory. Prerequisite, one course in general zoology or general botany.

A general introductory course designed to acquaint the student with the fundamental principles of heredity and variation. While primarily of interest to students of biology, it will be of value to those interested in the humanities. Required of students in zoology and aquiculture who do not have credit for Genetics 101 f. (Burhoe.)

ZOOL. 140. *Marine Zoology*—Credit to be arranged.

This work is given at the Chesapeake Biological Laboratory, which is conducted co-operatively by the Maryland Conservation Department and the Department of Zoology and Aquiculture, on Solomons Island, where the research is directed primarily toward those problems concerned with commercial forms, especially the blue crab and the oyster. The work starts during the third week of June and continues until mid-September, thus affording ample time to investigate complete cycles in life histories, ecological relationships, and plankton contents. Course limited to few students, whose selection will be made from records and recommendations submitted with applications, which should be filed on or before June 1.

Laboratory facilities, boats of various types fully equipped (pumps, nets, dredges and other apparatus), and shallow water collecting devices are available for the work without extra cost to the student. (Truitt.)

### Courses for Graduates

ZOOL. 200 y. *Marine Zoology*—Credit to be arranged. Problems in salt water animal life of the higher phyla. (Truitt.)

ZOOL. 201 y. *The Chordates*—Credit to be arranged.

Minor problems in embryology or anatomy. (Pierson.)

ZOOL. 202 y. *Experimental Zoology*—Credit to be arranged.

Problems in Physiology and related subjects. (Phillips.)

ZOOL. 203 f. *Advanced Animal Histology* (3-5)—Two lectures; one to three laboratories.

Detailed study of the structure and function of animal cells and tissues. Laboratory work consists of the technical methods used in microscopic preparation and examination. Registration limited. Permission of the instructor must be obtained before registration. (Phillips.)

# GRADUATE COURSES IN THE PROFESSIONAL SCHOOLS AT BALTIMORE

## SCHOOL OF MEDICINE

### ANATOMY

The courses recorded under "Minors" are acceptable as graduate courses only if they are taken to satisfy minor requirements in a major subject.

#### Minors

ANAT. 101 f. *Human Gross Anatomy* (10)—Five lectures, eighteen laboratory hours during October, November, December and January; three lectures and fifteen laboratory hours during February.

A complete dissection of the human body (exclusive of the central nervous system). (Uhlenhuth and Aycock.)

ANAT. 102 f. *Mammalian Histology* (6)—Two lectures; ten laboratories.

A general survey of the histological structure of the organs of mammals and man. Opportunity is offered for examining and studying a complete collection of microscopical sections. (Davis and Lutz.)

ANAT. 103 s. *Human Neurology* (4)—Three lectures; nine laboratory hours during May.

An elementary study of the human central nervous system. This course is an introduction to the general structure of the central nervous system mainly directed towards the fiber tracts and the nuclei contained therein. It includes a brief study of the eye and the internal ear. The laboratory work is based on a systematic dissection of the human brain and on microscopic study of the brain stem. (Davis and Rubenstein.)

#### Majors

ANAT. 202 f and s. *For work leading to a Ph.D. in Anatomy.*

A study of neurological problems based on 103 s and 201 s. Only students who have had preceding courses in neurology are eligible for this work. (Davis.)

ANAT. 204 f and s. *Advanced Endocrinology.* (Credit and time dependent upon the student's qualifications.)

A study of the morphological equivalent of function. By means of proper experimentation the morphological responses of the endocrines to extrinsic and intrinsic factors are examined. This course will lead the student toward work for the Ph.D. in Anatomy. (Uhlenhuth.)

### PHYSIOLOGY

#### Minors

PHYSIOLOGY 101. *The Principles of Physiology* (8)—Lectures and conferences four hours a week; laboratory six hours a week, October to March, inclusive. Prerequisite, Physiological Chemistry, Anatomy 103.

The course is designed primarily to meet the needs of medical students. Graduate students who take this course as a minor toward a higher degree are required to do extra-curricular work. (Ries, Conser, Harne.)

### Majors

PHYSIOLOGY 201. *Physiology of Blood, Circulation and Respiration* (4)—Lectures and conferences four hours a week; laboratory six hours a week during January, February and March. Prerequisite, Phys. 101. (Ries and Conser.)

PHYSIOLOGY 202. *Physiology of the Neuro-muscular System and Special Senses* (4)—Lectures and conferences four hours a week; laboratory six hours a week, during October, November and December. Prerequisite, Phys. 101. (Ries, Harne and assistant.)

PHYSIOLOGY 203. *Physiology of Digestion, Secretion, Excretion, Metabolism and Nutrition* (4)—Lectures and conferences three hours a week; laboratory six hours a week, during one quarter. Prerequisite, Phys. 101. (Ries, Harne, Conser, Painter.)

PHYSIOLOGY 204. *Selected Problems of Mammalian Physiology* (4)—One lecture and two laboratory periods each week from October to March inclusive. Prerequisite, Phys. 101.

The laboratory work is limited to eight students; registration by conference with instructor. (Ries.)

PHYSIOLOGY 205. *Research in Physiology*. Credit to be determined by amount and quality of work performed. Open to graduate students only.

### PHARMACOLOGY

All students majoring in Pharmacology with a view to securing the degree of Master of Arts or Doctor of Philosophy should secure special training in Mammalian Physiology, Organic Chemistry 202 y, and Physical Chemistry 10 y or preferably 102 f.

### Minor

PHARMACOLOGY 101 f and s. *General Pharmacology* (7)—Three lectures, seven laboratories.

This course consists of 50 lectures and 40 laboratory periods of three hours each; offered each year, January to May, inclusive, at Medical School. The fundamental principles of pharmacologic technic are taught in this course, hence it is a prerequisite for all other advanced courses in this subject. (Schultz and Evans.)

### Majors

PHARMACOLOGY 201 f. *The Pharmacology of Biologic Products*.

This course involves problems of modern therapy that can be studied from the experimental physiological point of view, which include such subjects as anaphylaxis, allergic reactions, anaphylactoid phenomena, non-specific protein therapy, toxins, antitoxins, and glandular products.

The seminars, lectures, and demonstrations will be somewhat broad in scope, but the research will be intensive along some one chosen subject. Glandular products and hormones, 1932-1933.

Credit dependent upon quality of work. (Schultz.)

PHARMACOLOGY 202 f. *The Pharmacology of Industrial Poisons.*

Including Insecticides and Parasite Remedies. The nature of the subject matter of this course will vary from year to year. Credit will depend upon the amount and quality of the work accomplished.

Offered in alternate years. (Not given in 1932-1933.) (Schultz.)

PHARMACOLOGY 203 f. *Chemotherapy.*

The action of new synthetic compounds from a pharmacodynamic point of view. Credit will depend upon the amount and quality of the work accomplished. (Schultz.)

PHARMACOLOGY 204 f and s. *Pharmacology Seminar*—One report period each week.

## SCHOOL OF PHARMACY

### PHARMACEUTICAL CHEMISTRY

#### Courses for Graduates and Advanced Undergraduates

PHAR. CHEM. 101 f. *Chemistry of Medicinal Products* (3-5)—Two lectures; one to three laboratory periods.

A study of the more important medicinal products with emphasis placed upon the relationship between chemical structure and physiological action. (Jenkins.)

PHAR. CHEM. 102 f. *Food and Drug Analysis* (4)—Two lectures; two laboratory periods.

A study of the applied analytical methods employed by public health and industrial laboratories to control food and drug products. (Jenkins.)

#### Courses for Graduates

PHAR. CHEM. 201 y. *Advanced Survey of Pharmaceutical Chemistry* (10)—Two lectures; three laboratory periods.

A study of the practical methods employed to isolate, purify, identify and analyze the constituents of crude drugs. (Jenkins.)

PHAR. CHEM. 202 y. *Advanced Pharmaceutical Syntheses* (8)—Two lectures; two laboratory periods.

A study of synthetic reactions methods applied to the synthesis of complex medicinal substances, and of the properties and structure of the products obtained by physical, chemical and physiological methods. (Jenkins.)

PHAR. CHEM. 203 y. *Pharmaceutical Chemistry Seminar* (2-4).

Reports of progress and discussion of the problems encountered in research and the presentation of papers which survey the recent developments of pharmaceutical chemistry reported in the current literature. (Jenkins.)

PHAR. CHEM. 204 y. *History of Pharmaceutical Chemistry* (2 or 4)—One lecture and assigned reading.

A study of the development of pharmaceutical chemistry in relation to the history of other sciences, industry and civilization. (Jenkins.)

PHAR. CHEM. 205 y. *Research in Pharmaceutical Chemistry*. Credit to be determined by the amount and the quality of the work performed. Open to graduate students only. (Jenkins.)

### PHARMACOGNOSY

#### Courses for Graduates and Advanced Undergraduates

PHARMACOG. 101 y. *Taxonomy of the Higher Plants* (4)—One lecture; one laboratory period.

A study of the kinds of seed plants and ferns, their classification, and field work on local flora. Emphasis will be placed on official drug plants. Instruction will be given in the preparation of an herbarium. Elective for students who contemplate taking advanced work in pharmacognosy. (Plitt.)



## Courses for Graduates

PHARMACOG. 201 y. *Advanced Vegetable Histology* (8)—Two lectures; two laboratory periods.

Section cutting, staining, embedding of material in celloidin and in paraffin, leading to research. Prerequisite, graduate standing. (Plitt.)

PHARMACOG. 202 y. *Advanced Study of Vegetable Powders* (8)—Two lectures; two laboratory periods.

A study of vegetable powders structurally and microchemically. Prerequisite, Pharmacognosy 201 y. (Plitt.)

PHARMACOG. 203 y. *Advanced Taxonomy of Vascular Plants*. Credit dependent on work done. Prerequisite, Pharmacog. 101 y. (Plitt.)

PHARMACOG. 204 y. *Research in Pharmacognosy*. Credit according to amount and quality of work performed. Open to graduate students only. (Plitt.)

## PHARMACOLOGY AND THERAPEUTICS

### Courses for Graduates and Advanced Undergraduates

PHARMACOLOGY 101 s. *Physiological Assaying and Testing* (4)—Two lectures; two laboratory periods.

A course in physiological drug assaying with special reference to the methods of the United States Pharmacopoeia and National Formulary. Prerequisite, physiology and hygiene. (Thompson.)

### Courses for Graduates

PHARMACOLOGY 201 y. *Advanced Physiological Assaying and Testing* (8)—Two lectures; two laboratory periods.

A study of modern unofficial methods of physiological assaying applied to the evaluation of medicinal substances. Prerequisite, Pharmacology 101 s. (Thompson.)

PHARMACOLOGY 202 y. *Special Studies in Pharmacodynamics* (2-4)—Two lectures; two laboratory periods.

Chiefly a study of the stability of drugs and their corresponding pharmaceutical preparations by physiological assay methods. Prerequisite, Pharmacology 101 s. (Thompson.)

PHARMACOLOGY 203 y. *Physiological Assay Methods* (4-8)—Two lectures; two laboratory periods.

The development of physiological assay methods for drugs for which no satisfactory chemical or physiological methods are known, involving both library and experimental studies. Prerequisite, Pharmacology 101 s. (Thompson.)

PHARMACOLOGY 204 y. *Research in Pharmacology and Therapeutics*. Credit in proportion to the amount and quality of the work performed. (Thompson.)

## PHARMACY

### Courses for Graduates and Advanced Undergraduates

PHARMACY 101 y. (6)—One lecture; two laboratory periods.

A continuation of the courses given in the pharmacy school in the second and third year with special reference to the methods employed in manufacturing pharmacy. Prerequisite, consent of the instructor. (DuMez.)

### Courses for Graduates

PHARMACY 201 y. *Advanced Pharmaceutical Technology* (8)—Two lectures; two laboratory periods.

A study of pharmaceutical manufacturing processes from the standpoint of plants; crude materials used, their collection, preservation, and transformation into forms suitable for therapeutic application. (DuMez.)

PHARMACY 202 y. *Survey of Pharmaceutical Literature*. Credit according to the work performed.

Lectures and topics on the literature pertaining to pharmacy with special reference to the origin and development of the works on drug standards and the pharmaceutical periodicals. (DuMez.)

PHARMACY 203 y. *History of Pharmacy*. Credit according to the work performed.

Lectures and topics on the development of pharmacy in America and the principal countries in Europe. (DuMez.)

PHARMACY 204 y. *Research in Pharmacy*. Credit according to the amount and quality of the work done. (DuMez.)

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